

# U.S. POLYMERIC

## HITCO MATERIALS DIVISION

(NASA-CR-1794C9) FINGERPRINT TEST DATA  
REPORT: FM 50642 (KAISER) LCIS NC. 1 (K) -  
IC. 4 (K) (HITCO) 276 P CSCL 11B

N89-12723

G3/27 Unclass  
0140165



FM 5064J (KAISER) LOTS #1 (K) - #4 (K)

FINGERPRINT TEST DATA REPORT

NAS8-36298

COPY # 9

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NAS8-36298

U.S. Polymeric D.E. 71108

Filler Lot for NASA Lot# 1

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# FILLER TESTING

NAS8-36298

U.S. POLYMERIC D.E. 71108

## Filler Lot for NASA Lot# 1

1. Carbon Content, %  
QAI-5560

SAMPLE		
#1-1	#1-2	#1-3
99.17	99.10	99.12
NASA LOT# 1	AVERAGE	99.13

2. Ash Content, %  
PTM-71B

.005	.000	.000
<u>.009</u>	<u>.014</u>	<u>.005</u>
AVG. .007	.007	.003
NASA LOT# 1	AVERAGE	.006

3. Atomic Absorption, ppm  
CTM-53B  
(Values are average of  
2 determinations)

	#1-1	#1-2	#1-3	LOT#1 AVG.
Na	3.0	2.0	1.5	2.2
K	1.5	0.0	0.0	0.5
Ca	0.0	0.0	0.0	0.0
Mg	0.5	0.0	0.0	0.2
Li	0.0	0.0	0.0	0.0
TOTAL	5.0	2.0	1.5	2.8

3a. Moisture Content, %  
CTM-53B

.005	.010	.005
<u>.019</u>	<u>.005</u>	<u>.005</u>
AVG. .010	.008	.005
NASA LOT# 1	AVERAGE	.008

3b. Ash Content, %  
CTM-53B

0.000	0.000	0.000
<u>0.000</u>	<u>0.000</u>	<u>0.005</u>
AVG. 0.000	0.000	0.003
NASA LOT# 1	AVERAGE	0.001

4. pH, Units  
ASTM D1512

4.85	4.85	4.95
<u>4.90</u>	<u>4.90</u>	<u>5.05</u>
AVG. 4.88	4.88	5.00
NASA LOT# 1	AVERAGE	4.92

5. Particle Size, microns  
S.E.M. procedure  
(Average values are  
of 10 determinations)

AVG.	.45	.36	.38
Maximum	.65	.62	.85
Minimum	.22	.17	.22
Std. Dev	.08	.08	.08
NASA LOT# 1	AVERAGE SIZE	.40	

6a. TGA, °C at 50% Loss  
CTM-51

750	751	749
NASA LOT# 1	AVERAGE	750

HITCO MATERIALS DIVISION

700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 505-1130 • FAX # (714) 549-2858-5-2437



Filler Lot for NASA Lot# 1

6b. TGA  
CTH-51

See Charts 6A-6C

7. Particle Size Distribution  
CTH-72

See Charts 7A-7C

7a. Particle Size, microns  
CTH-72

	<u>#1-1</u>	<u>#1-2</u>	<u>#1-3</u>
	.87	.88	.92
	<u>.86</u>	<u>.95</u>	<u>.95</u>
AVG.	.86	.92	.94
NASA LOT# 1	AVERAGE		.91

U.S. Polymeric

*Hamid M. Quraishi*

Hamid M. Quraishi, Manager  
Quality Assurance Department

Sample: 1-1  
Size: 8.84 mg  
Run No: MIR #12830 (13)  
Date: JAN/31/86 12:59

Operator: M. WEGENER  
Disk ID: DATA DISK #93  
File No: D 35.DAT V2.1  
Plotted: FEB/04/86 07:23

# TGA

OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL

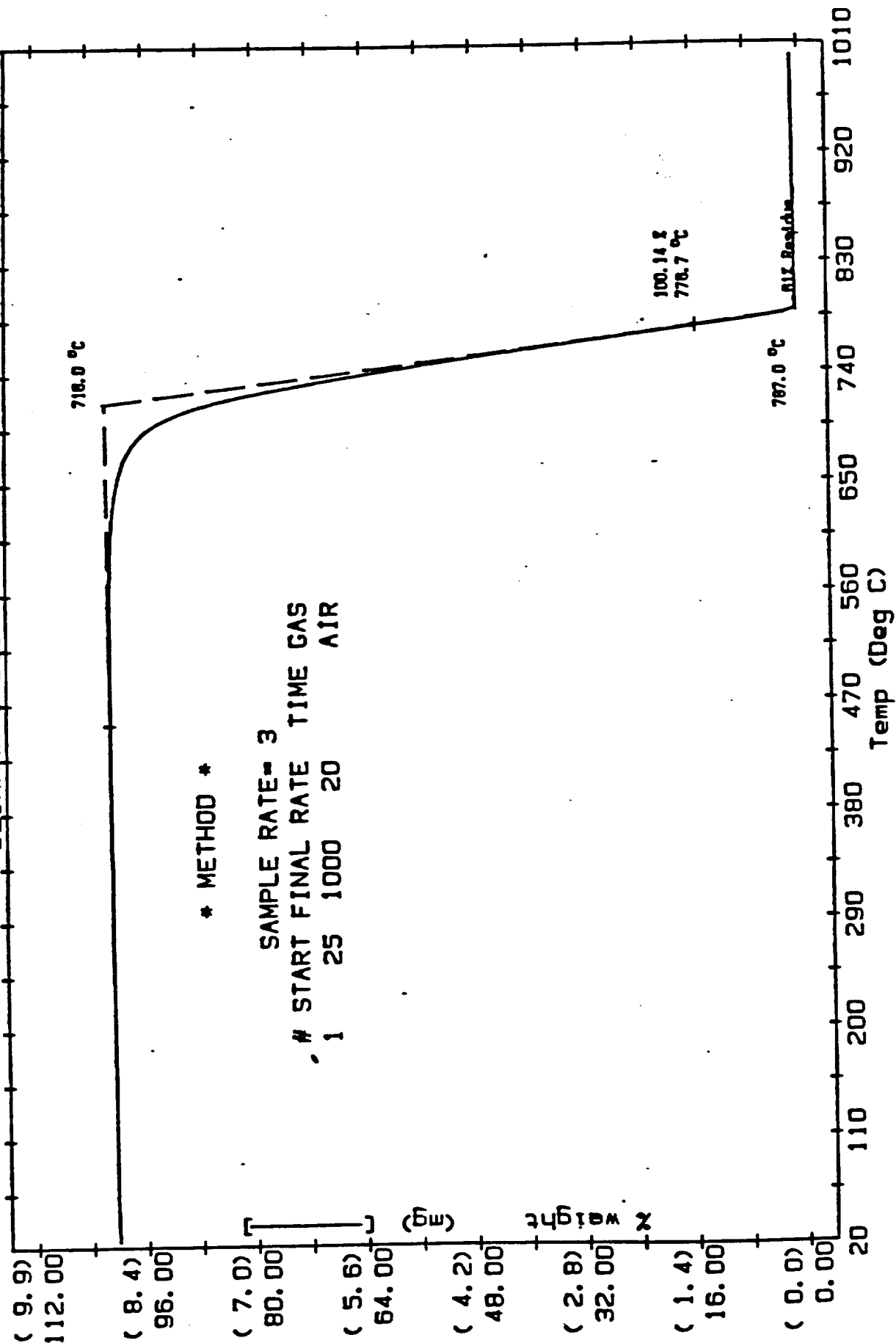


CHART 6A

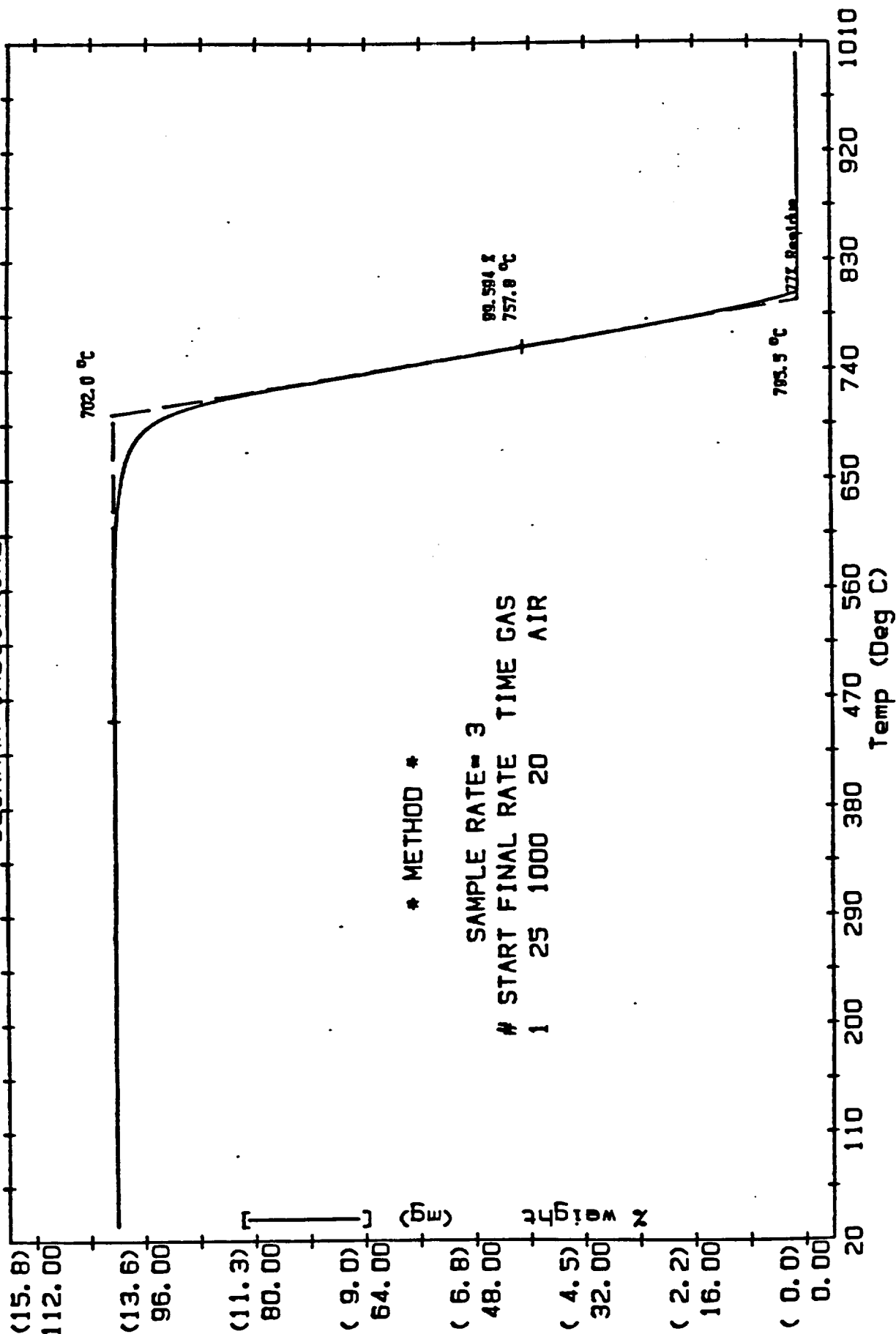
ANALYTICAL LABORATORY SERVICES

**Beckman Industrial**

Operator: M. WEGENER  
 Disk ID: DATA DISK #93  
 File No: D 36.DAT V2.1  
 Plotted: FEB/04/86 07:27

TGA  
 OMNITHERM DATA SYSTEM  
 BECKMAN INDUSTRIAL

Sample: 1-2  
 Size: 14.192 mg  
 Run No: MIR #12830 (13)  
 Date: FEB/03/86 07:13



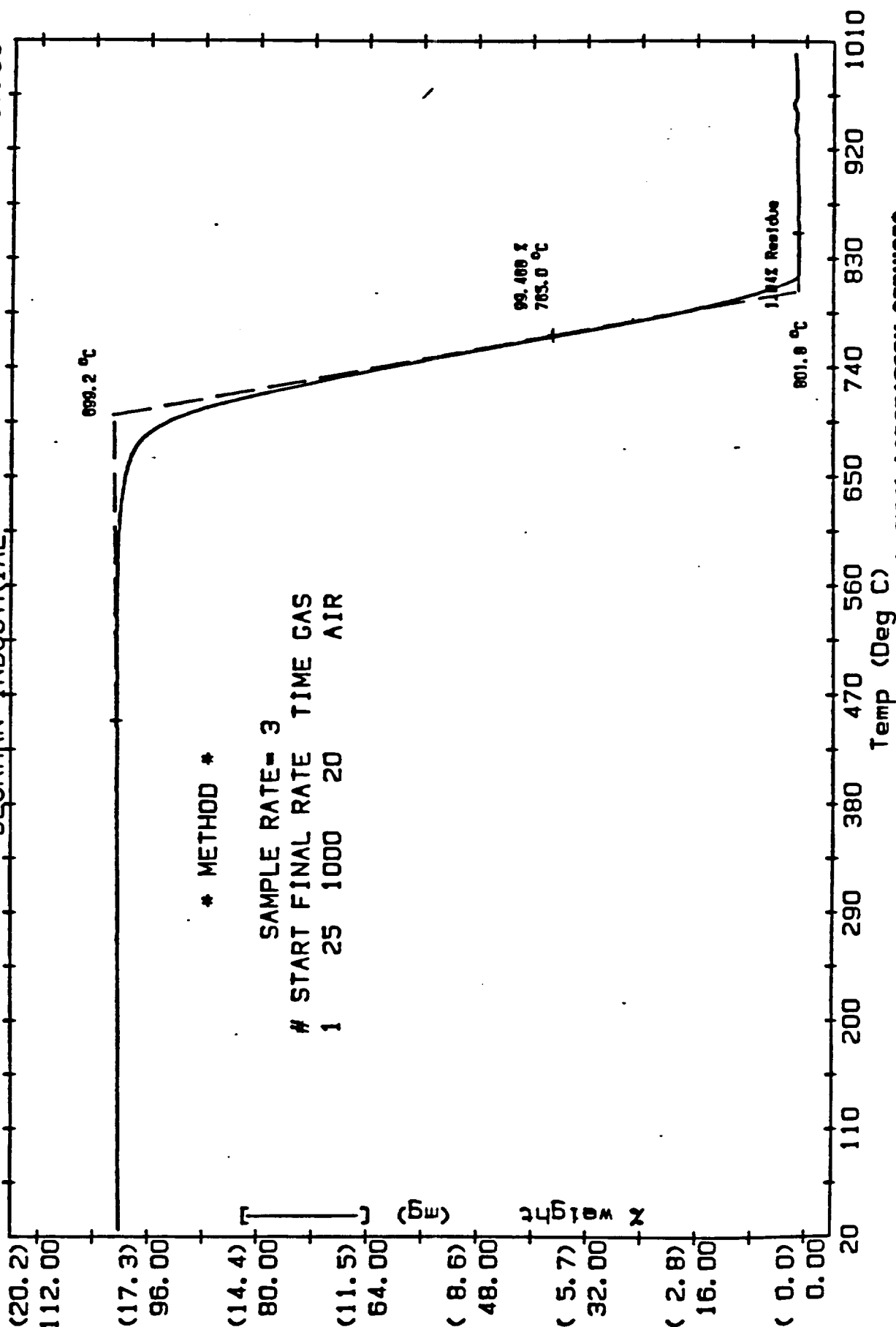
ANALYTICAL LABORATORY SERVICES

**Beckman Industrial**

Sample: 1-3  
 Size: 18.045 mg  
 Run No: MIR #12830 (13)  
 Date: FEB/03/86 08:45  
 Operator: M. WEGENER  
 Disk ID: DATA DISK #93  
 File No: D 37.DAT V2.1  
 Plotted: FEB/04/86 07:36

TGA

OMNITHERM DATA SYSTEM  
 BECKMAN INDUSTRIAL



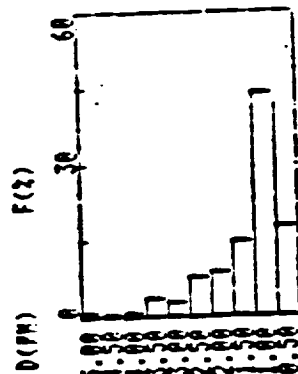
ANALYTICAL LABORATORY SERVICES

**Beckman Industrial**

• DISTRIBUTION TABLE (BY VOL.)

D(PH)	F(2)	R(2)
5.00 <	0.0	0.0
5.00-4.50	0.9	0.9
4.50-4.00	0.1	1.0
4.00-3.50	0.6	1.6
3.50-3.00	3.4	5.0
3.00-2.50	2.7	7.7
2.50-2.00	7.8	15.5
2.00-1.50	8.6	24.0
1.50-1.00	14.5	38.5
1.00-0.50	43.9	82.5
0.50-0.00	17.5	100.0
D(AVE)	0.87 (PH)	

• DISTRIBUTION GRAPH (BY VOL.)

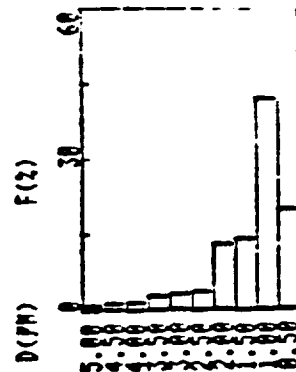


Lot #1-1  
Sample 1

• DISTRIBUTION TABLE (BY VOL.)

D(PH)	F(2)	R(2)
5.00 <	0.0	0.0
5.00-4.50	0.7	0.7
4.50-4.00	1.1	1.8
4.00-3.50	1.4	3.3
3.50-3.00	2.5	5.7
3.00-2.50	2.7	8.4
2.50-2.00	3.6	12.0
2.00-1.50	12.8	24.8
1.50-1.00	13.9	38.7
1.00-0.50	41.7	80.4
0.50-0.00	19.6	100.0
D(AVE)	0.86 (PH)	

• DISTRIBUTION GRAPH (BY VOL.)



Lot #1-1  
Sample 2

HORIBA CAPA-500  
PARTICLE ANALYZER

#2  
DATE 5-22-86  
SAMPLE NASA LOT#1-1  
SOLVENT ETHYL GLYCOL  
C=0.013 mg/ml

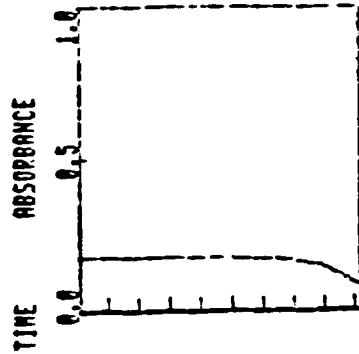
• CONDITIONS

SOLV. VISC 19.90(CP)  
SOLV. DENS 1.11(G/CC)  
SAMP. DENS 1.90(G/CC)  
D(MAX) 5.0 (PH)  
D(MIN) 0.01(PH)  
D(DIV) 0.50(PH)

SPEED 5000. (RPM)

• TIME 0 H 11 MIN 31 SEC

• DATA

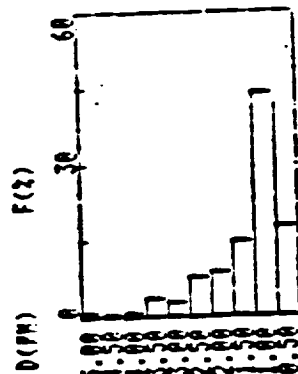


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• DISTRIBUTION TABLE (BY VOL.)

D(PH)	F(2)	R(2)
5.00 <	0.0	0.0
5.00-4.50	0.9	0.9
4.50-4.00	0.1	1.0
4.00-3.50	0.6	1.6
3.50-3.00	3.4	5.0
3.00-2.50	2.7	7.7
2.50-2.00	7.8	15.5
2.00-1.50	8.6	24.0
1.50-1.00	14.5	38.5
1.00-0.50	43.9	82.5
0.50-0.00	17.5	100.0
D(AVE)	0.87 (PH)	

• DISTRIBUTION GRAPH (BY VOL.)



Lot #1-1  
Sample 1

HORIBA CAPA-500  
PARTICLE ANALYZER

#1  
DATE 5-22-86  
SAMPLE NASA LOT#1-1  
SOLVENT ETHYL GLYCOL  
C=0.013 mg/ml

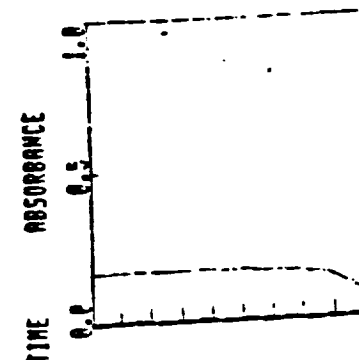
• CONDITIONS

SOLV. VISC 19.90(CP)  
SOLV. DENS 1.11(G/CC)  
SAMP. DENS 1.90(G/CC)  
D(MAX) 5.0 (PH)  
D(MIN) 0.01(PH)  
D(DIV) 0.50(PH)

SPEED 5000. (RPM)

• TIME 0 H 11 MIN 31 SEC

• DATA



HORIBA CAPA-500  
PARTICLE ANALYZER

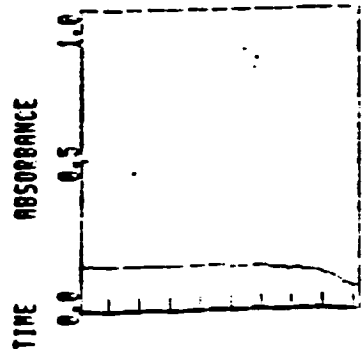
DATE 5-24-86  
#1 SAMPLE NASA Lot# 1-2  
SOLVENT ETHYL-GLYCOL  
C=0.01 mg/ml  
\* CONDITIONS

SOLV. VISC 19.90(CP)  
SOLV. DENS 1.11(G/CC)  
SAMP. DENS 1.90(G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01(PM)  
D(DIV) 0.50(PM)

SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

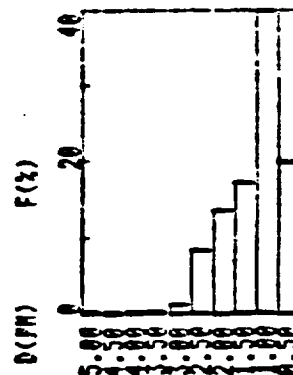
\* DATA



\* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.0	0.0
3.00-2.50	1.1	1.1
2.50-2.00	8.2	9.3
2.00-1.50	13.7	23.0
1.50-1.00	17.2	40.2
1.00-0.50	39.9	80.1
0.50-0.00	19.9	100.0
D(AVE)	0.88 (PM)	

\* DISTRIBUTION GRAPH (BY VOL.)



*Lot# 1-2  
Sample 1*

HORIBA CAPA-500  
PARTICLE ANALYZER

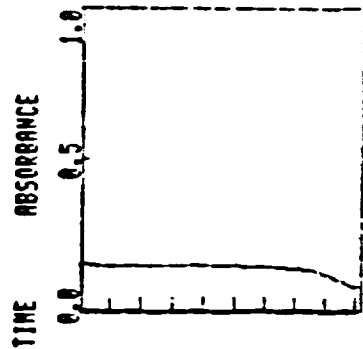
DATE 5-24-86  
#2 SAMPLE NASA Lot# 1-2  
SOLVENT ETHYL-GLYCOL  
C=0.01 mg/ml  
\* CONDITIONS

SOLV. VISC 19.90(CP)  
SOLV. DENS 1.11(G/CC)  
SAMP. DENS 1.90(G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01(PM)  
D(DIV) 0.50(PM)

SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

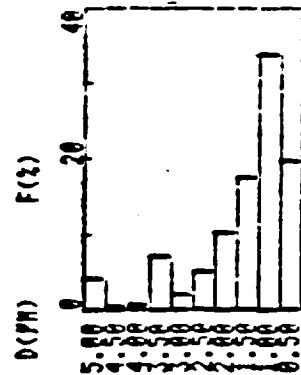
\* DATA



\* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	4.1	4.1
4.50-4.00	0.2	4.3
4.00-3.50	0.4	4.8
3.50-3.00	7.1	11.9
3.00-2.50	1.9	13.8
2.50-2.00	4.8	18.7
2.00-1.50	18.3	29.0
1.50-1.00	17.5	46.5
1.00-0.50	33.8	80.3
0.50-0.00	19.7	100.0
D(AVE)	0.95 (PM)	

\* DISTRIBUTION GRAPH (BY VOL.)



*Lot# 1-2  
Sample 2*

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CHART 7B

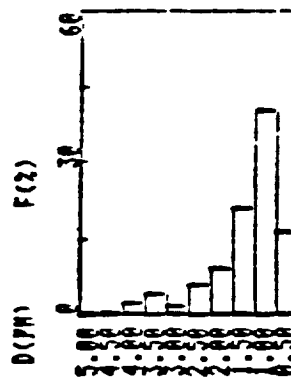
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• DISTRIBUTION TABLE (BY VOL.)

D(PH)	F(%)	R(%)
5.00 (	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	2.1	2.1
3.50-3.00	4.0	6.0
3.00-2.50	1.5	7.5
2.50-2.00	5.0	13.3
2.00-1.50	9.2	22.5
1.50-1.00	20.0	43.3
1.00-0.50	40.4	83.7
0.50-0.00	16.3	100.0

D(AVE) 0.92 (PH)

• DISTRIBUTION GRAPH (BY VOL.)



HORIBA CAPA-500

PARTICLE ANALYZER

DATE 5-24-86  
SAMPLE NASAL LOT #1-3  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

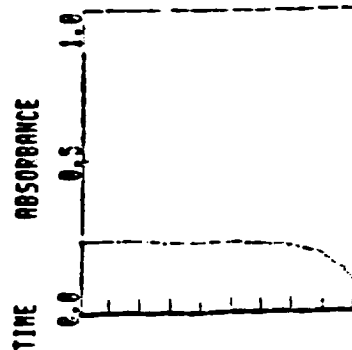
• CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D(MAX) 5.0 (PH)  
D(MIN) 0.01 (PH)  
D(DIV) 0.50 (PH)

SPEED 5000. (RPM)

• TIME 0 H 11 MIN 31 SEC

• DATA



HORIBA CAPA-500

PARTICLE ANALYZER

DATE 5-24-86  
SAMPLE NASAL LOT #1-3  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

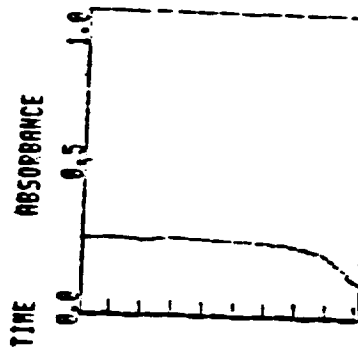
• CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D(MAX) 5.0 (PH)  
D(MIN) 0.01 (PH)  
D(DIV) 0.50 (PH)

SPEED 5000. (RPM)

• TIME 0 H 11 MIN 31 SEC

• DATA

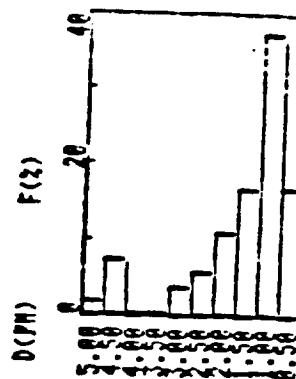


• DISTRIBUTION TABLE (BY VOL.)

D(PH)	F(%)	R(%)
5.00 (	0.0	0.0
5.00-4.50	1.6	1.6
4.50-4.00	7.3	9.0
4.00-3.50	0.0	9.0
3.50-3.00	0.0	9.0
3.00-2.50	3.6	12.6
2.50-2.00	5.7	18.3
2.00-1.50	11.0	29.3
1.50-1.00	16.6	45.9
1.00-0.50	37.2	83.1
0.50-0.00	16.9	100.0

D(AVE) 0.95 (PH)

• DISTRIBUTION GRAPH (BY VOL.)



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## RESIN TESTING

NAS8-36298

U.S. Polymeric D.E. 71108

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7. TGA.....	1
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9. HPLC.....	1
10. GPC.....	1
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12. Phenol Content.....	2
13. Chang's Index.....	2
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15. NMR.....	2

## CHARTS

Gas Chromatography.....	6A - 6B
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HPLC.....	9A - 9B
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RDS.....	14A - 14B
NMR.....	15A - 15B





## RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 1

1. Resin Solids, % PTM-7C		<u>#1-1</u>	<u>#1-2</u>	
		79.4	80.2	
		80.2	80.5	
		<u>81.2</u>	<u>81.7</u>	
	AVG.	80.3	80.8	
	LOT# 1	AVERAGE	80.6	
2. Specific Gravity @ 25°C PTM-29C		1.186	1.193	
	LOT# 1	AVERAGE	1.190	
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		16,750	18,750	
	LOT# 1	AVERAGE	17,750	
4. Gel Time, min:sec PTM-47B		3:30	3:47	
	LOT# 1	AVERAGE	3:39	
5. Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)		<u>#1-1</u>	<u>#1-2</u>	<u>LOT# AVG</u>
	Na	22.5	31.3	26.9
	K	0.3	0.5	0.4
	Ca	5.3	5.8	5.5
	Mg	2.0	2.0	2.0
	Li	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
	AVG.	30.0	39.5	34.8
6. Volatiles, Gas Chromatography CTM-55		See Charts 6A-6B		
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)		39.1	37.9	
	LOT# 1	AVERAGE	38.5	
		See Chart 7A-7B		
8. DSC, temperature °C CTM-50A		187	187	
	LOT# 1	AVERAGE	187	
		See Chart 8A-8B		
9. HPLC CTM-49A		See Chart 9A-9B		
10. GPC, Average molecular wt. CTM-49A		1231	1291	
	LOT# 1	AVERAGE	1261	
		See Chart 10A-10B		

USP-39A Resin Lot for NASA Lot# 1

11. pH, units CTM-1B	<u>#1-1</u>	<u>#1-2</u>
	8.3	8.4
	LOT# 1	AVERAGE 8.4
12. Phenol Content, % CTM-55 Appendix 1	13.89	13.96
	<u>13.77</u>	<u>14.03</u>
	AVG. 13.83	14.00
	LOT# 1	AVERAGE 13.91
13. Chang's Index, ml. CTM-5B	23.4	23.8
	LOT# 1	AVERAGE 23.6
14. RDS, Minimum Viscosity, cps. CTM-57A	<u>Min. Visc.</u>	<u>-C</u>
	#1-1	229
	#1-2	290
	AVG.	259
		115
		119
		117
15. NMR Vendor procedure	See Charts 14A-14B	
	See Charts 15A-15B	

U. S. Polymeric

*Hamid M. Quraishi*  
 Hamid M. Quraishi, Manager  
 Quality Assurance Department

# TYPICAL GAS CHROMATOGRAPH SET-UP

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Operator <u>Q. M. J.</u>	Date <u>12/1/86</u>
Column <u>6 ft.</u>	Detector <u>FID</u>
Length <u>1/4 in.</u>	Voltage <u>          </u>
Dia. <u>AT-1000</u>	Sensit. <u>          </u>
Liquid Phase <u>AT-1000</u>	Flow Rates, ml/min
Wt. % <u>0.1</u>	Hydrogen <u>60</u> Air <u>96</u>
Support <u>GRAPH-PAC</u>	Scavenge <u>          </u>
Mesh <u>80/100</u>	Split <u>          </u>
Carrier Gas <u>He</u>	Temperature, °C
Rotameter <u>          </u>	Det. <u>220</u> Inj. <u>220</u>
Inlet Press <u>60</u> psig	Column Initial <u>60</u>
Rate <u>30</u> ml/min	Final <u>210</u>
CHART SPEED <u>          </u>	Rate <u>5°C/MIN</u>
SAMPLE <u>USP39A-FI</u>	Solvent <u>THF</u>
Size <u>0.1 µl</u>	Concn. <u>0.10227 g/ml</u>

## GAS CHROMATOGRAPHY STANDARD SOLVENT

### TEST METHOD CTM-55

#### STANDARD SOLVENT/MONOMER

#### RETENTION TIME (MINS.)

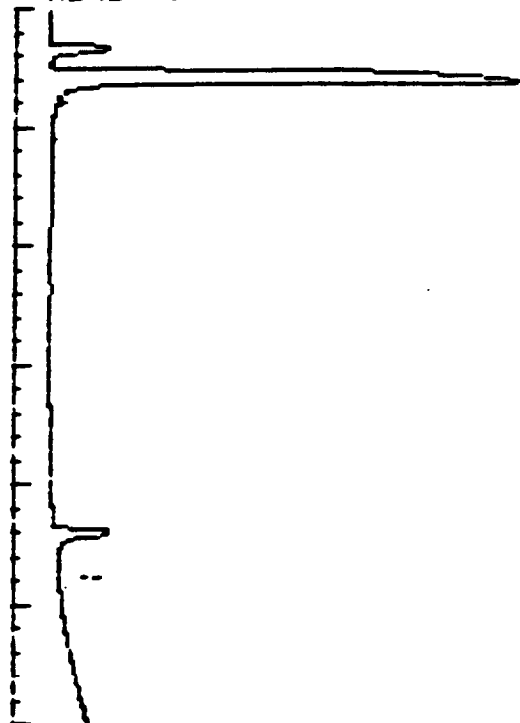
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

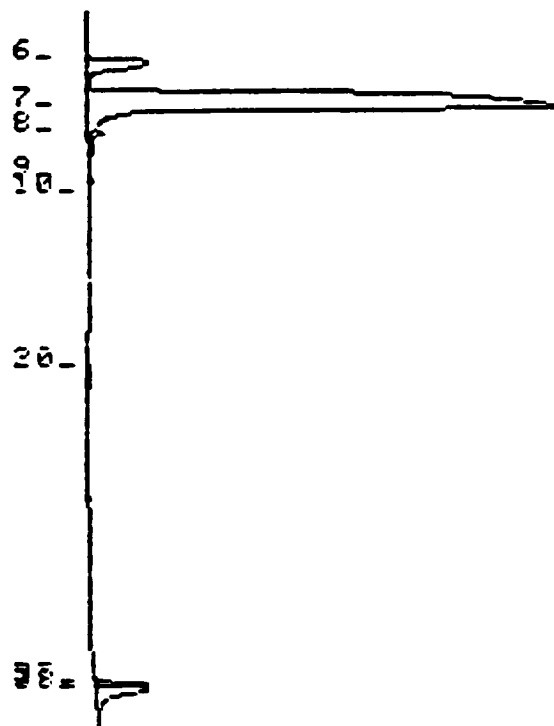
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OF POOR QUALITY

CHART 6A

\*\*\* REAL TIME CHROMATOGRAM \*\*\*



VERTICAL SCALE FACTOR: 1X



ANAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 1-1  
ISC.: C=0.10227 GMS/ML

TIME: 11:15  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA B % L	PEAK HT.
3	0.65	2553	.008	3
6	1.70	255870	6.813	2
7	3.25	3126900	83.361	3
8	4.03	55251	1.471	4
9	5.55	6042	.161	4
0	6.05	7408	.197	4
0	11.75	7490	.199	3
37	21.95	107040	2.850	2
8	22.13	186990	4.979	2

TOTAL AREA= 3755543  
THRESHOLD= 1  
MIN PK WIDTH= 15  
AREA REJECT= 1000

SAMPLE: USP39A 1-1  
MISC.: C=0.10227 GMS/ML

TIME: 11:15  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

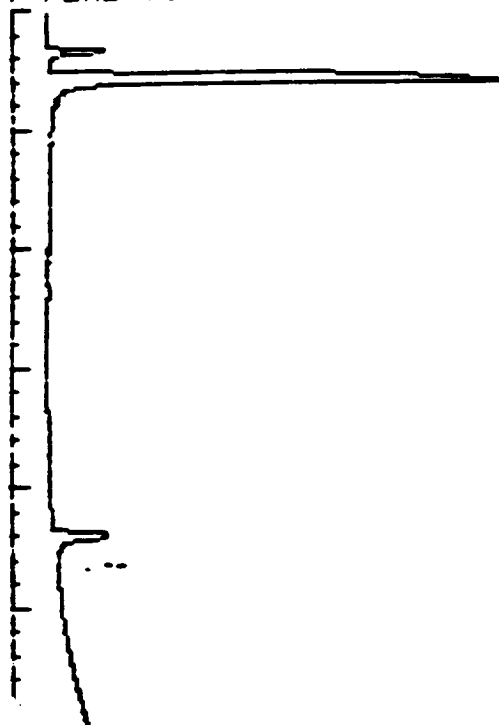
PK NO.	RET TIME	PEAK AREA	AREA B % L	PEAK HT.
6	1.70	255870	6.856	2
7	3.25	3126900	83.785	3
8	4.03	55251	1.480	4
37	21.95	107040	2.868	2
38	22.13	186990	5.010	2

TOTAL AREA= 3732051  
THRESHOLD= 1  
MIN PK WIDTH= 15  
AREA REJECT= 10000

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CIART 6B

\* REAL TIME CHROMATOGRAM \*\*\*



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 1-2  
MISC.: C=0.10006 GMS/ML

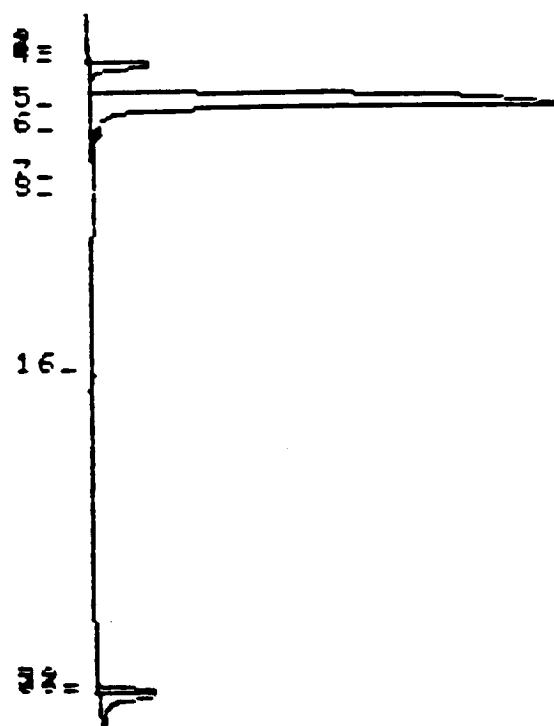
TIME: 11:56  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

P N	RET TIME	PEAK AREA	AREA B % L	PEAK HT.
	.65	1623	.056 2	262
	1.25	1128	.039 2	53
3	1.45	1143	.040 2	122
4	1.73	195650	6.780 2	11047
	3.15	2357000	61.673 3	87114
	4.00	33273	1.153 4	1558
7	5.58	3232	.112 4	314
	6.08	1817	.063 4	67
1	11.75	7514	.260 1	419
	21.98	104640	3.626 2	10260
	22.10	178880	6.198 2	10209

TOTAL AREA= 2885899  
THRESHOLD= 1  
MIN. PK. WIDTH= 15  
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 1-2  
MISC.: C=0.10006 GMS/ML

TIME: 11:56  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA B % L	PEAK HT.
4	1.73	195650	6.818 2	11047
5	3.15	2357000	82.141 3	87114
6	4.00	33273	1.160 4	1558
32	21.98	104640	3.647 2	10260
33	22.10	178880	6.234 2	10209

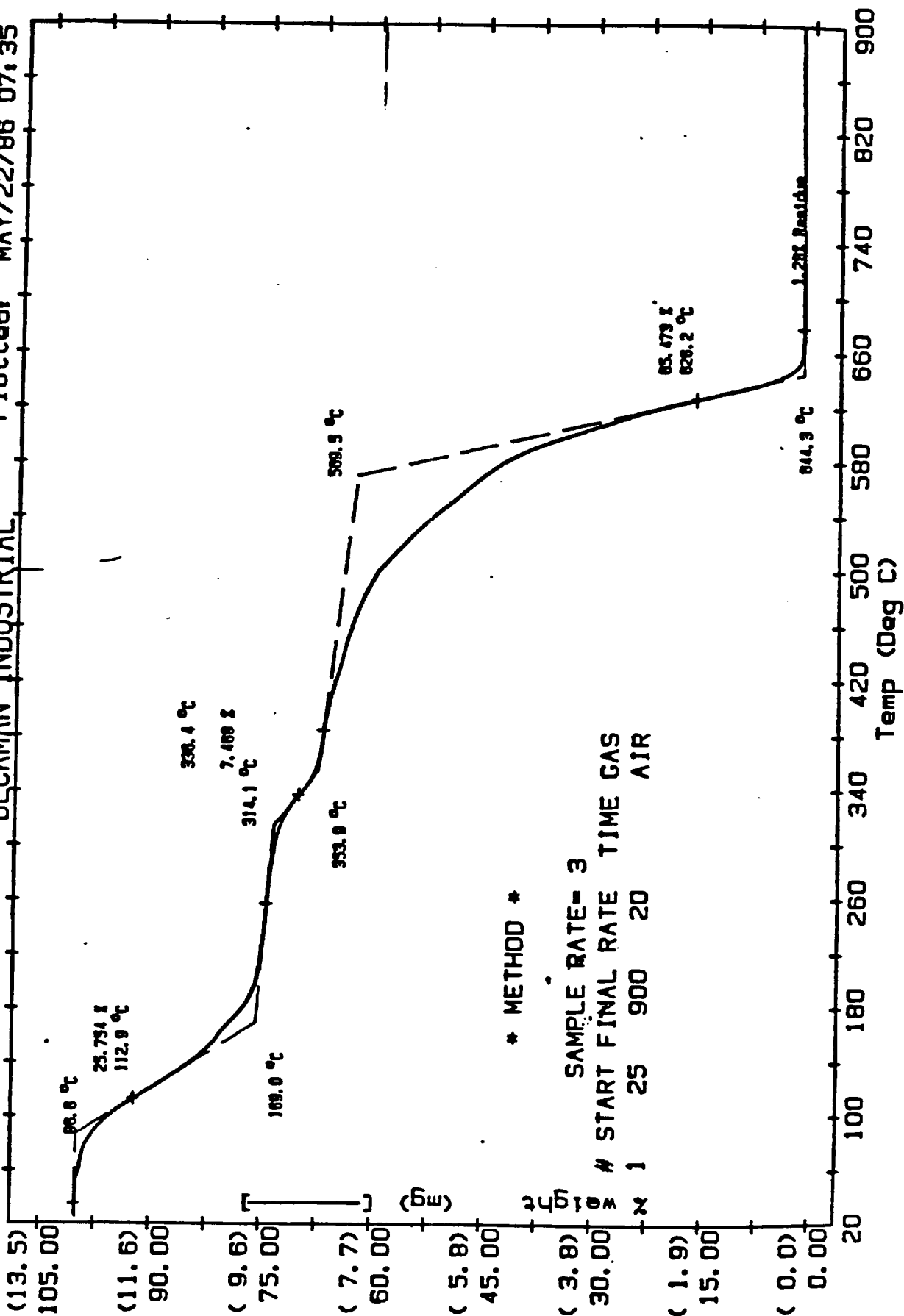
TOTAL AREA= 2869443  
THRESHOLD= 1  
MIN. PK. WIDTH= 15  
AREA REJECT= 10000

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OF POOR QUALITY

Sample: USP39A71108 1-1  
Size: 12.898 mg  
Run No: MIR #13079 (12)  
Date: MAY/21/86 07:14  
Operator: M. WEGENER  
Disk ID: DATA DISK #107  
File No: D 32.DAT V2.1  
Plotted: MAY/22/86 07:35

# TGA

OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL



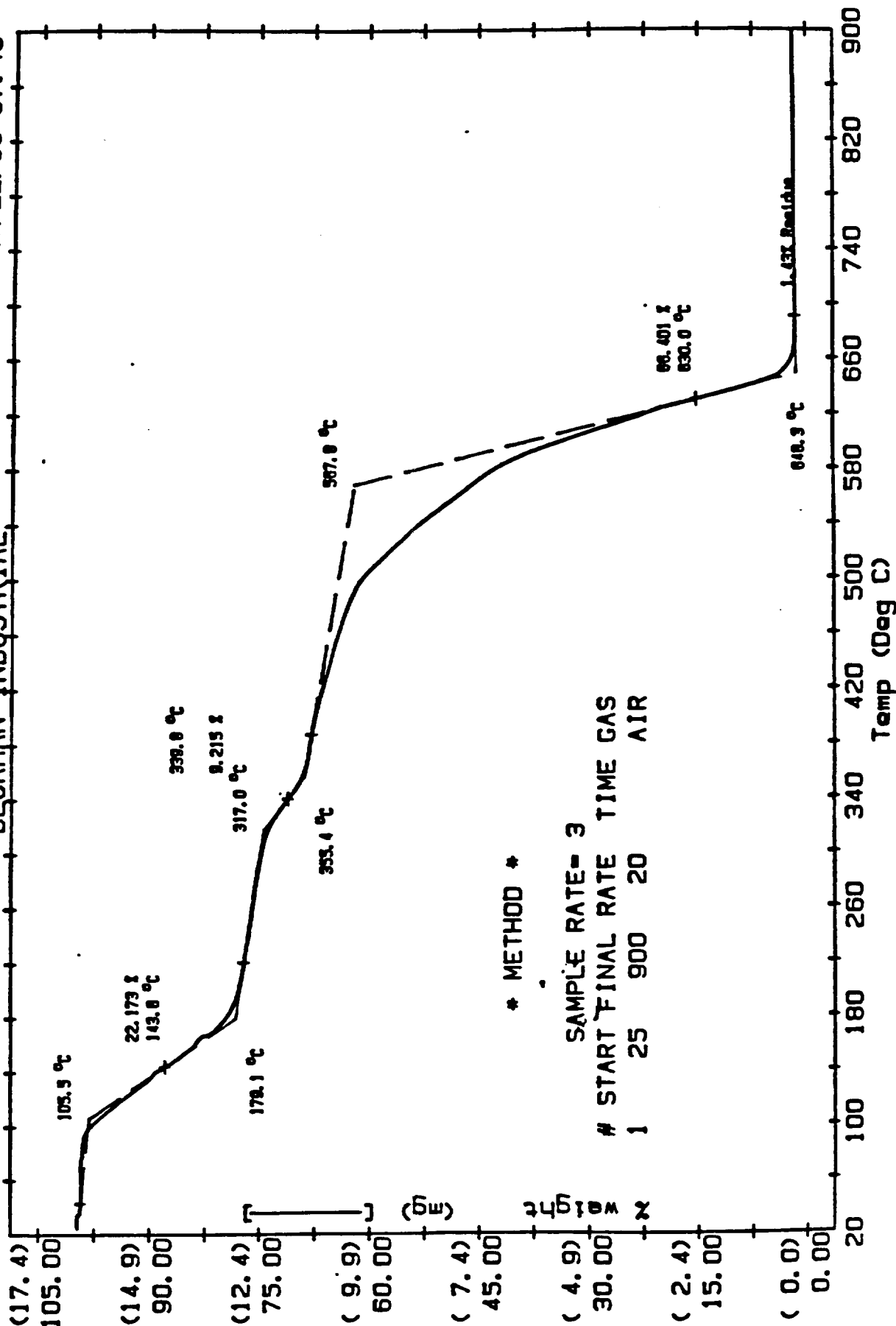
ORIGINAL PAGE 15  
OF POOR QUALITY

Sample: USP39A71108 1-2  
Size: 16.572 mg  
Run No: MIR #13079 (12)  
Date: MAY/21/86 08:28

Operator: M. WEGENER  
Disk ID: DATA DISK #107  
File No: D 33.DAT V2.1  
Plotted: MAY/22/86 07:45

# TGA

OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL



ANALYTICAL LABORATORY SERVICES

**Beckman Industrial**

PART NO. 990088

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OF POOR QUALITY

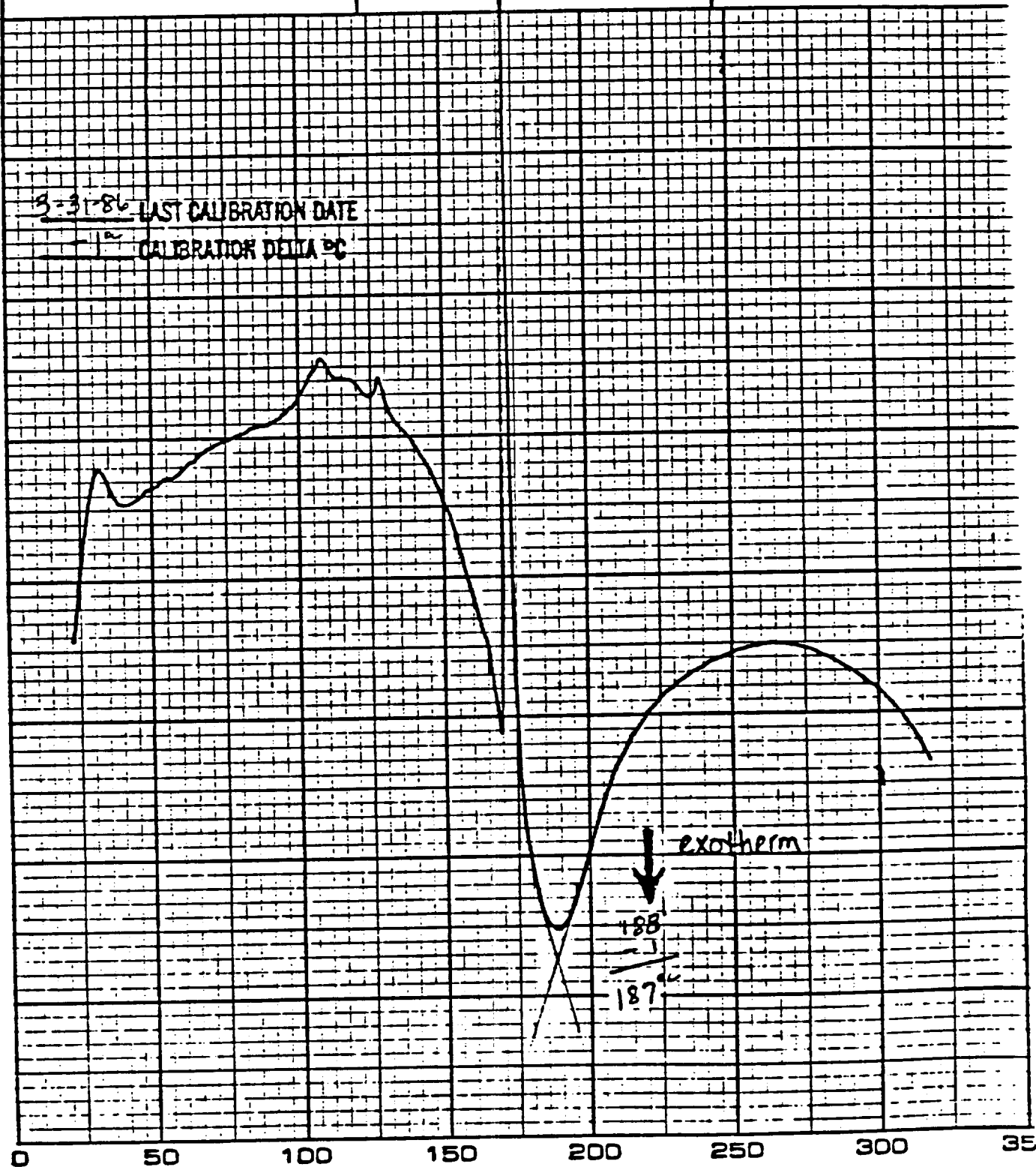
CHART 8A

RUN NO. \_\_\_\_\_ DATE 4/3/86OPERATOR JS  
SAMPLE: 1-1ATM. H<sub>2</sub> @ 1 atm.FLOW RATE 40 ml/min.

T-AXIS

SCALE, °C/in. 50PROG. RATE, °C/min. 20HEAT ✓ COOL     ISO    SHIFT, in. 0-1° AC

DTA-DSC

SCALE, °C/in. 1.0/5[mcal/sec]/in.    WEIGHT, mg 3.4REFERENCE    1 AL CUP & SEA3-31-86 LAST CALIBRATION DATE    CALIBRATION DELTA °C

DU PONT Instruments



PART NO. 990088

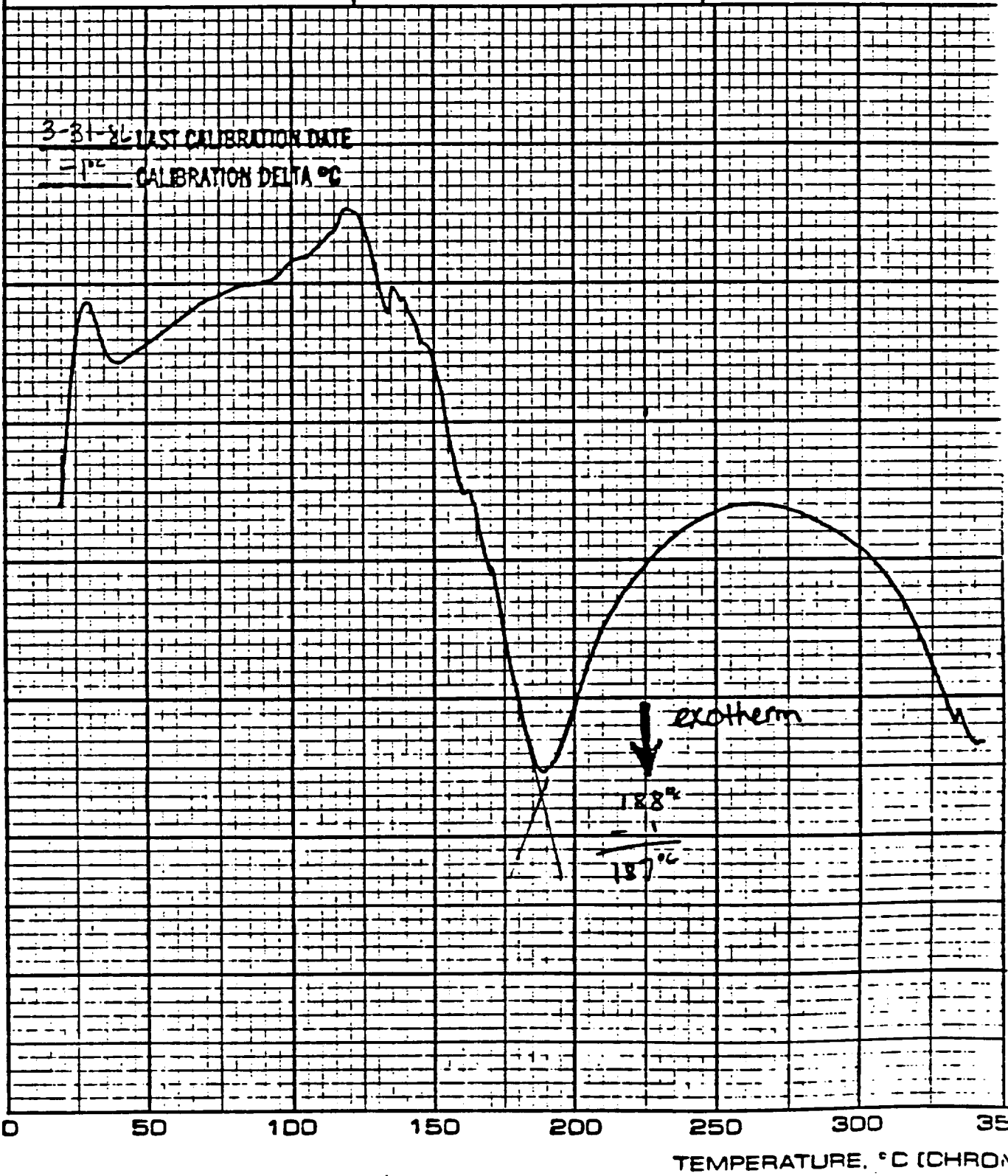
CHART 8B

RUN NO. _____ DATE <u>4/3/86</u>	T-AXIS	DTA-DSC
OPERATOR <u>JD</u> SAMPLE: <u>1-2</u>	SCALE, °C/in. <u>50</u> PROG. RATE, °C/min. <u>20</u>	SCALE, °C/in. <u>1.0/5</u> (mcal/sec)/in. _____
ATM. <u>H<sub>2</sub></u> @ <u>1 atm.</u> FLOW RATE <u>40 ml/min</u>	HEAT <u>COOL</u> <u>ISO</u> SHIFT, in. <u>0</u>	WEIGHT, mg <u>3.4</u> REFERENCE _____
_____	- <u>1° ΔC°</u>	<u>1AL cup &amp; SEAL</u>

DUPONT Instruments



MEASURED VARIABLE \_\_\_\_\_



DATA FILE A:PHEN026.HDR TAKEN 09-05-1986 11:06:32

## \*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

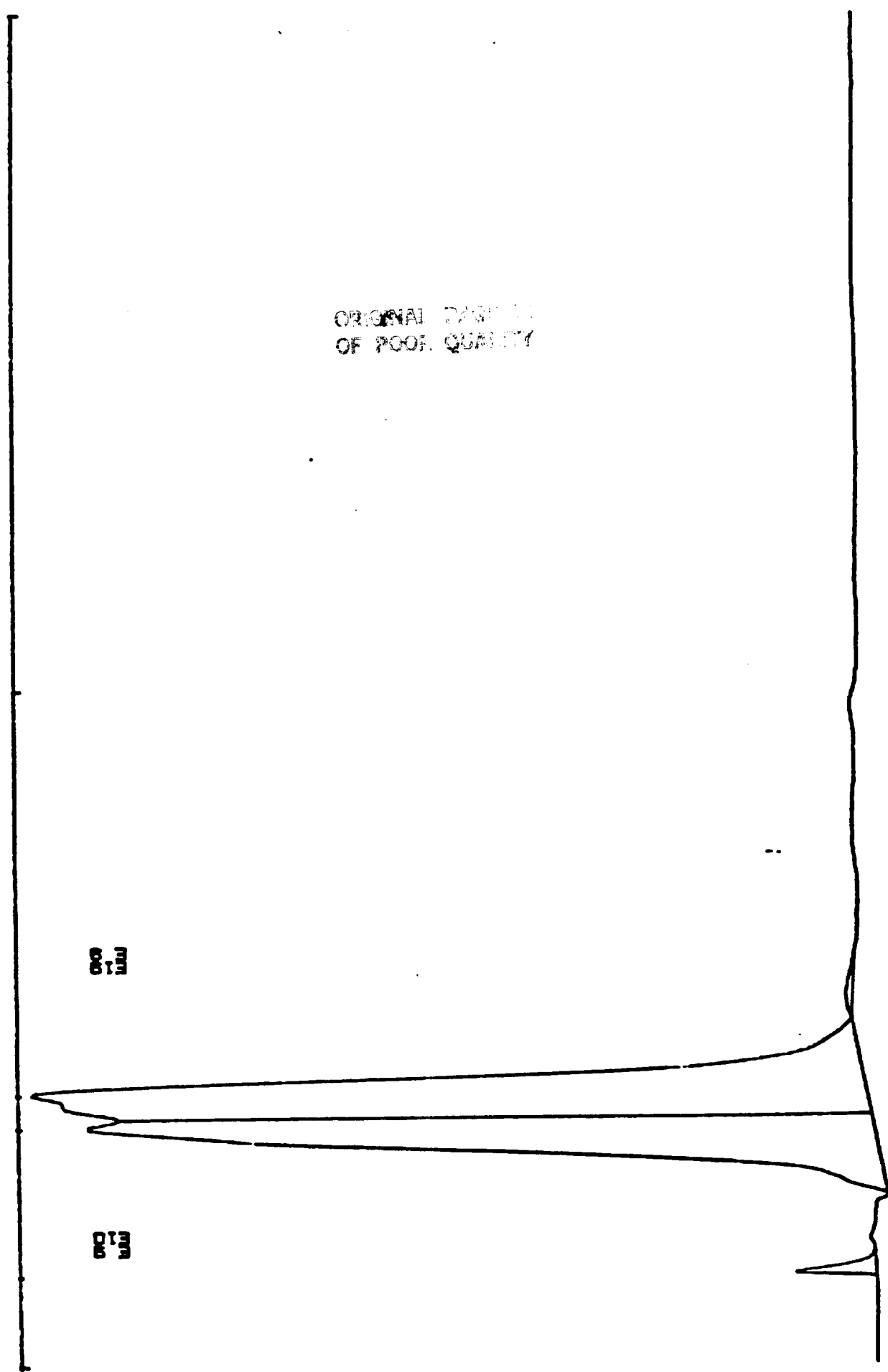
\*\*\*\*\*  
\* Sample Name: USP39A,1-1,C=6.54 Operator Initials: JGZ \*  
\* Date: 09-05-1986 11:06:32 Method:PHENOLIC DATA FILE: A:PHEN026.PTS \*  
\* Interface: 4 Cycle#: 26 Channel#: 0 Vial#: N.A. \*  
\* Starting Peak Width: 10 Threshold: .01 \*  
\*\*\*\*\*  
\* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18 \*  
\* Solvent Description: THF/WATER, 2:1 BY WEIGHT \*  
\* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN \*  
\* Detector 0: 220NM/.5AU Detector 1: \*  
\* Misc. Information: LENGTH=25 \*  
\*\*\*\*\*  
Starting Delay: 0.00 Ending Retention Time: 10.00

Peak No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.70	2030	1.1563	1	510	2.103	4.0
2	1.80	76982	43.8499	2	4940	79.736	15.6
3	2.05	96545	54.9937	2	5248	100.000	18.4

Total Area: 175557 Area Reject: 1000 One sample per 1.000 sec.

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OF POOR QUALITY

TA ... E( ... 328 ... 10. ... MIN ... DW ... 3.4 ... 1.71 ... IV.  
 USP-38A, 1-1, C-0.54 MG/ML, 9/5/88, JGZ  
 0.70 1.8 2.5



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 OF POOR QUALITY

TA FILE A:PHEND19.HDR TAKEN 09-01-1986 13:18:26

## \*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

\*\*\*\*\*

Sample Name: USP39A,1-2,C=5.07 Operator Initials: JGZ \*

Date: 09-01-1986 13:18:26 Method:PHENDLIC DATA FILE: A:PHEND19.PTS \*

Interface: 4 Cycle#: 19 Channel#: 0 Vial#: N.A. \*

Starting Peak Width: 10 Threshold: .01 \*

\*\*\*\*\*

Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18 \*

Solvent Description: THF/WATER, 2:1 BY WEIGHT \*

Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN \*

Detector 0: 220NM/.5AU Detector 1: \*

Misc. Information: LENGTH=25 \*

\*\*\*\*\*

Starting Delay: 0.00 Ending Retention Time: 10.00

	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.70	4065	2.2807	1	1019	5.202	4.0
2	1.78	78141	43.8419	2	5072	100.000	15.4
3	1.93	34258	19.2209	2	5165	43.841	6.6
4	2.03	61769	34.6565	2	5379	79.049	11.5

Total Area: 178233 Area Reject: 1000 One sample per 1.000 sec.

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OF POOR QUALITY



# GPC CALIBRATION PLOT

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\*\*\* Calibration Data \*\*\*  
Calibration Names:  
Misc Informations:

Fit Type: 3

Log Mol Wt =  $A + Bx + Cx^2 + Dx^3$

A= 2.538977 B= 2.115815 C= -.5646824

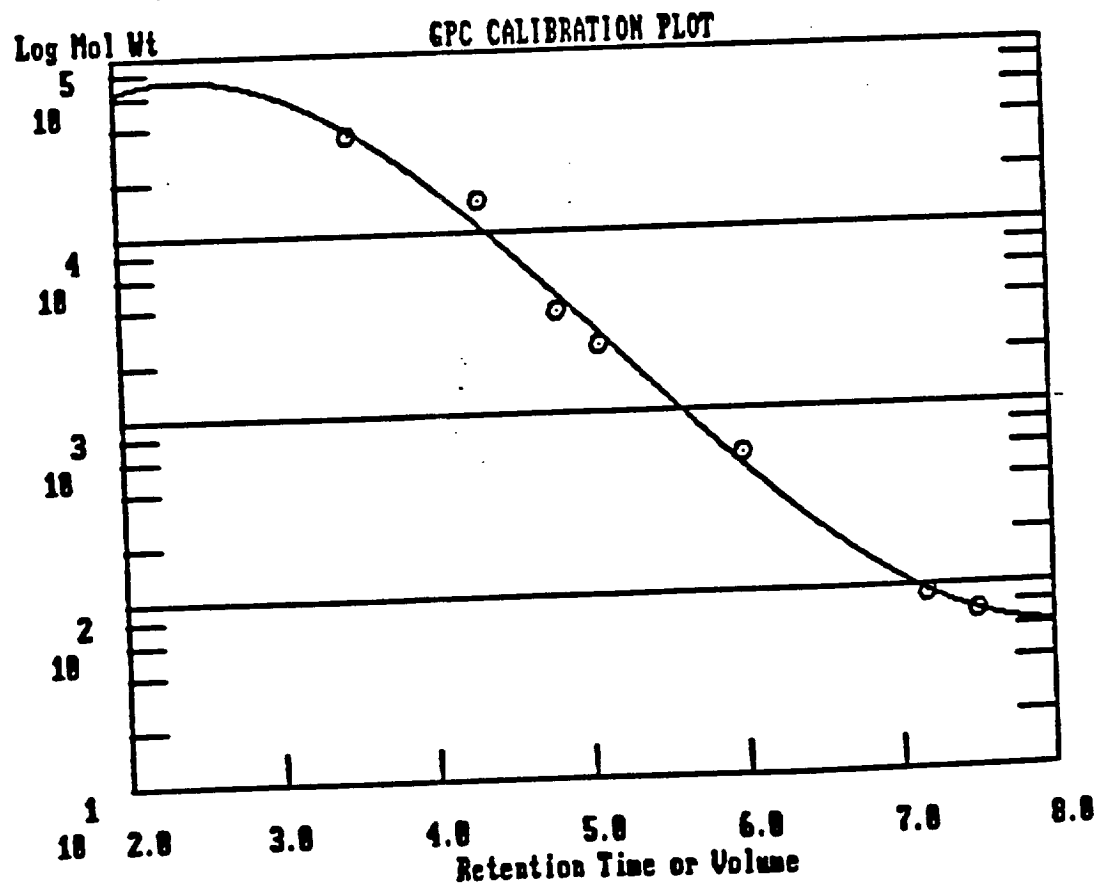
D= 3.606432E-02

Coefficient of Determinations: 0.9902

Ret Time Molecular Weight

Log Mol Wt

3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



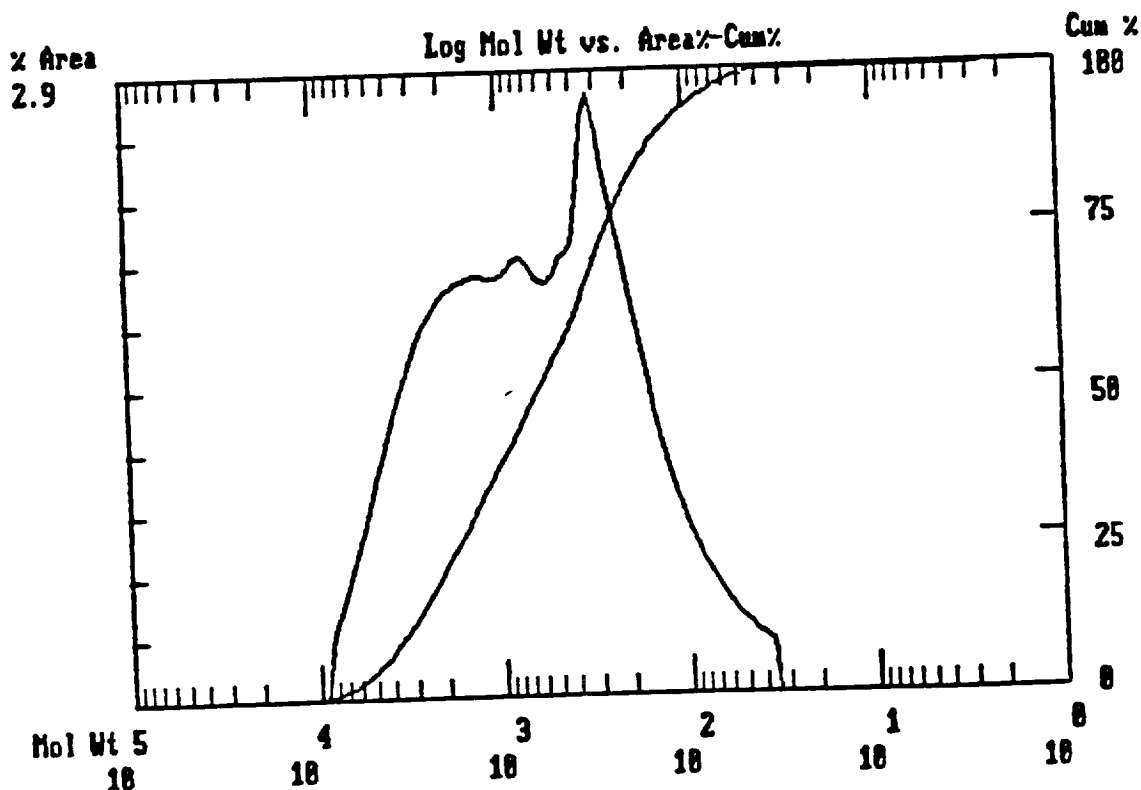
ATA FILE A:GPC31.HDR TAKEN 08-05-1986 17:39:57

## \*\*\*\*\* GPC REPORT \*\*\*\*\*

```

*****
* *****
* Sample Name: USP39A 1-1=2.68          Operator Initials: GBF      *
* Date: 08-05-1986 15:00:24 Method:      DATA FILE: A:GPC31.PTS    *
* Interface: 5                          Cycle#: 31          Channel#: 0   Vial#: N.A.  *
* Starting Peak Width: 60 Threshold: 0   *****
* *****
* Instrument Type: HPLC/BECKMAN          Column Type: ULTRASTYRAGEL 500A *
* Solvent Description: THF
* Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
* Detector 0: 254NM/.1AU                Detector 1:
* Misc. Information: CALIBRATION/GPC
* *****
* Starting Delay: 0.00                  Ending Retention Time: 10.00
* Calibration file: GPCPHEN
* Molecular Weight Distribution Averages
* Baseline TIMES: 3.85 to 10.00 MW: 22295 to 2
* Process TIMES: 3.85 to 10.00 MW: 22295 to 2
* Total Area: 211188
* W: 1231
* Mn= 312
* Wt Mn= 3.9362
* IZ: 3069
* IV= 1076

```



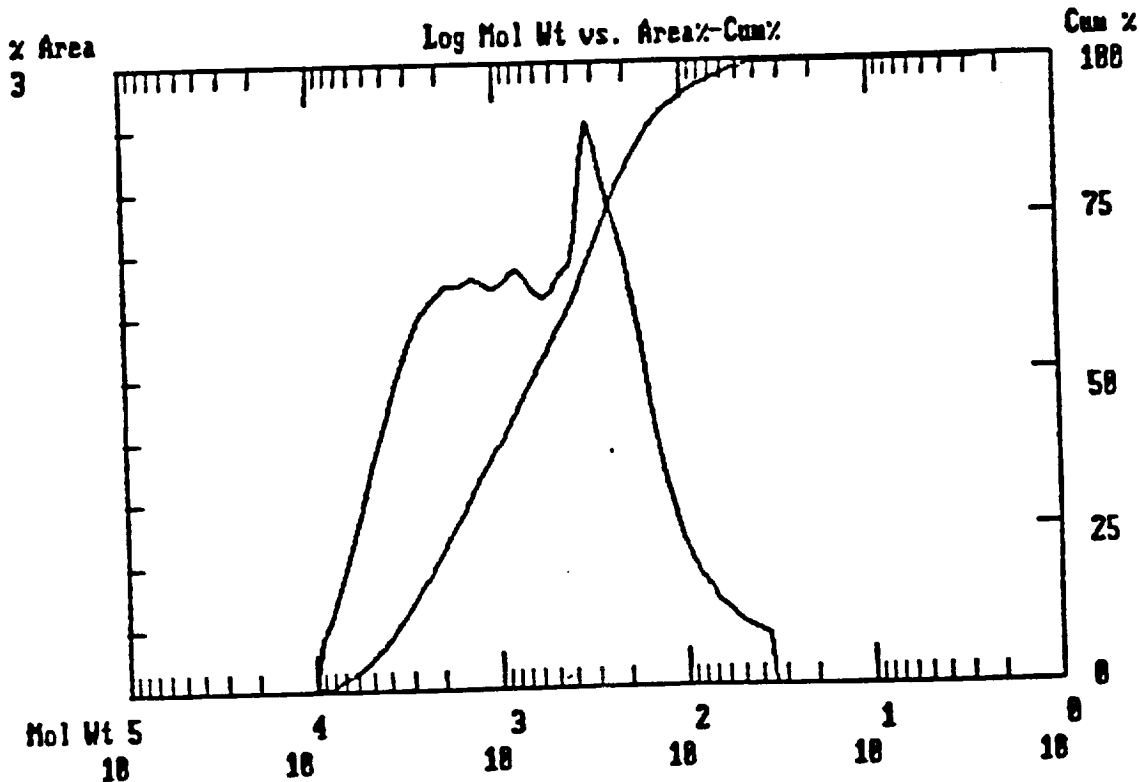
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\*\*\*\*\* GPC REPORT \*\*\*\*\*

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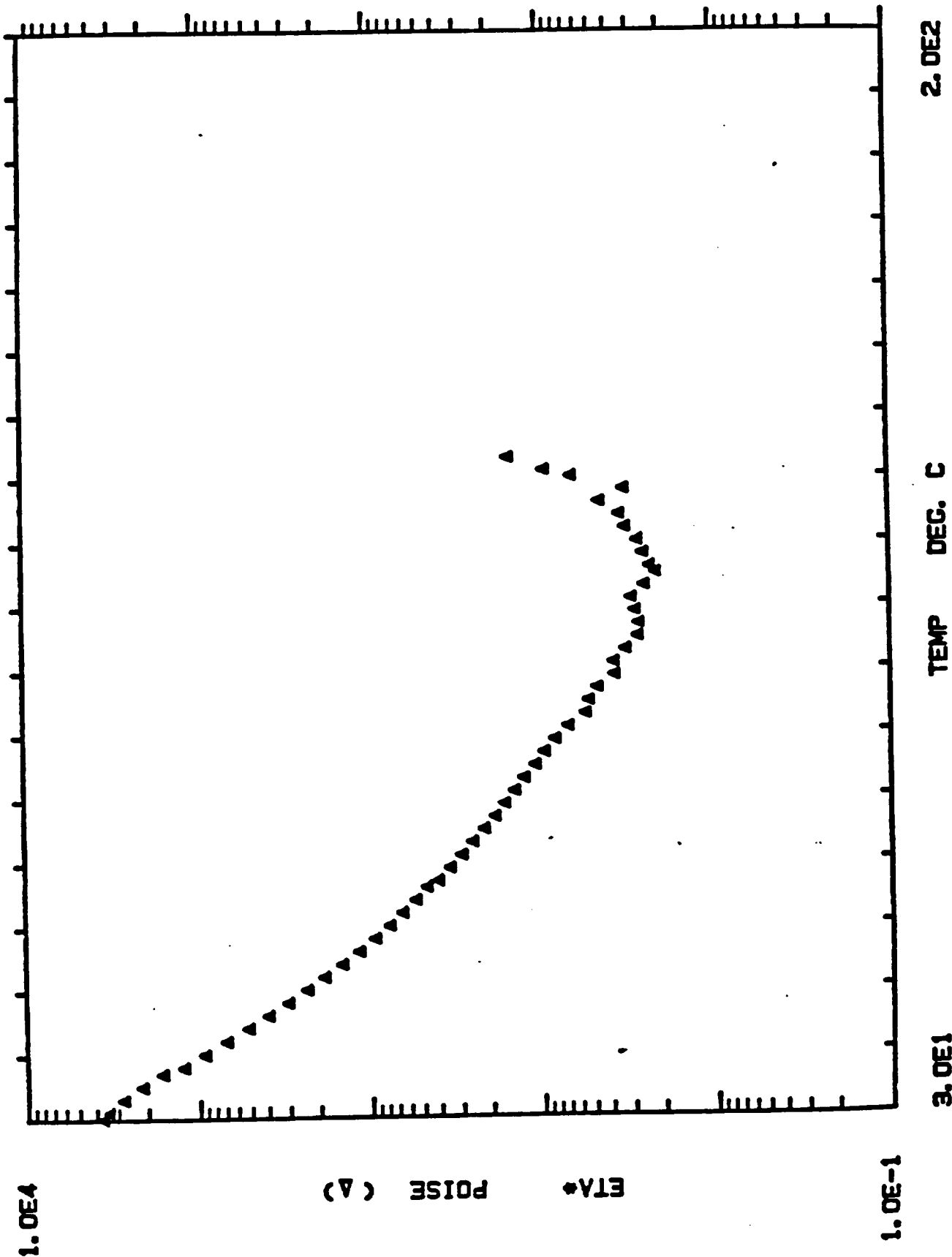
*****
Sample Name: USP39A 1-2=2.68                      Operator Initials: GBF      *
Date: 08-05-1986 15:15:18 Method:                 DATA FILE: A:GPC32.PTS   *
Interface: 5                               Cycle#: 32          Channel#: 0    Vial#: N.A.    *
Starting Peak Width: 60   Threshold: 0
* (*****
Instrument Type: HPLC/BECKMAN                  Column Type: ULTRASTYRAGEL 500A *
      Solvent Description: THF
      Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
      Detector 0: 254NM/.1AU                   Detector 1:
      Misc. Information: CALIBRATION/GPC
*****
Waiting Delay: 0.00                               Ending Retention Time: 10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Sample Line TIMES: 3.85 to 10.00 MW: 22295 to 2
Dissolve TIMES: 3.85 to 10.00 MW: 22295 to 2
Total Area: 211824
Peak 1: 1291
Peak 2: 324
Mn/Mw: 3.9783
Peak 1: 3246
Peak 2: 1126

```





NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1



Rheometrics RECAP II

---

Experiment No. : 8 Sample No. : 1

File:  
SA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

Operator : CP

Date and Time : Monday, August 18, 1986 - 15:30:51

Operating Mode : DYNAMIC

Test Type : CURE

Geometry : DISK & PLATE  
RADIUS : 25.00  
GAP : 0.50

Strain :  
Strain = 50%  
Frequency = 10 RAD/SEC

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OF POOR QUALITY

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

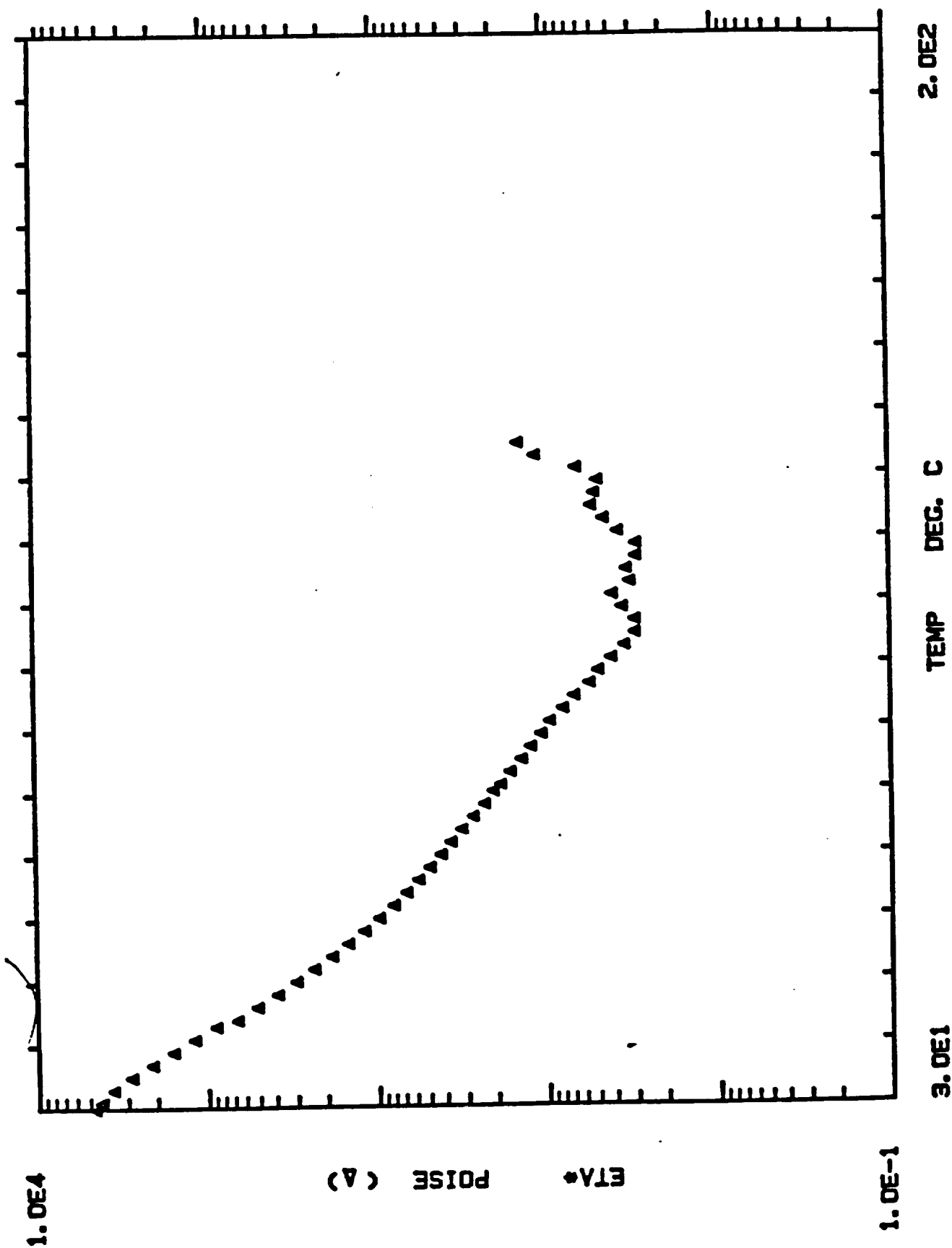
NO.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
	3.813e+003	3.813e+003	6.049e+001	4.876e+002	2.000e-001	3.000e+001
2	3.514e+003	3.514e+003	6.792e+001	4.470e+002	1.000e+000	3.100e+001
3	2.873e+003	2.873e+003	4.505e+001	3.658e+002	2.000e+000	3.300e+001
	2.233e+003	2.232e+003	4.101e+001	2.837e+002	3.000e+000	3.500e+001
5	1.691e+003	1.690e+003	3.527e+001	2.144e+002	4.000e+000	3.700e+001
6	1.277e+003	1.277e+003	3.445e+001	1.615e+002	5.000e+000	3.800e+001
	9.594e+002	9.588e+002	3.542e+001	1.211e+002	6.000e+000	4.000e+001
	7.177e+002	7.169e+002	3.398e+001	9.048e+001	7.000e+000	4.200e+001
9	5.372e+002	5.368e+002	2.240e+001	6.768e+001	8.000e+000	4.400e+001
10	4.111e+002	4.104e+002	2.378e+001	5.171e+001	9.000e+000	4.600e+001
11	3.153e+002	3.144e+002	2.382e+001	3.963e+001	1.000e+001	4.800e+001
12	2.442e+002	2.432e+002	2.197e+001	3.070e+001	1.100e+001	5.000e+001
13	1.934e+002	1.921e+002	2.259e+001	2.429e+001	1.200e+001	5.200e+001
14	1.529e+002	1.514e+002	2.136e+001	1.921e+001	1.300e+001	5.400e+001
15	1.214e+002	1.200e+002	1.858e+001	1.524e+001	1.400e+001	5.600e+001
16	9.808e+001	9.666e+001	1.659e+001	1.232e+001	1.500e+001	5.800e+001
17	8.082e+001	7.951e+001	1.448e+001	1.015e+001	1.600e+001	6.000e+001
18	6.811e+001	6.697e+001	1.242e+001	8.554e+000	1.700e+001	6.200e+001
19	5.720e+001	5.620e+001	1.064e+001	7.178e+000	1.800e+001	6.400e+001
20	4.908e+001	4.819e+001	9.274e+000	6.157e+000	1.900e+001	6.600e+001
21	4.220e+001	4.139e+001	8.182e+000	5.291e+000	2.000e+001	6.700e+001
22	3.613e+001	3.546e+001	6.922e+000	4.536e+000	2.100e+001	6.900e+001
23	3.089e+001	3.033e+001	5.841e+000	3.879e+000	2.200e+001	7.100e+001
24	2.675e+001	2.623e+001	5.276e+000	3.358e+000	2.300e+001	7.300e+001
25	2.282e+001	2.244e+001	4.144e+000	2.867e+000	2.400e+001	7.500e+001
26	1.974e+001	1.940e+001	3.659e+000	2.477e+000	2.500e+001	7.700e+001
27	1.732e+001	1.699e+001	3.366e+000	2.175e+000	2.600e+001	7.900e+001
28	1.517e+001	1.488e+001	2.933e+000	1.903e+000	2.700e+001	8.100e+001
29	1.335e+001	1.317e+001	2.145e+000	1.676e+000	2.800e+001	8.300e+001
30	1.149e+001	1.132e+001	1.950e+000	1.442e+000	2.900e+001	8.500e+001
31	1.013e+001	9.893e+000	2.167e+000	1.272e+000	3.000e+001	8.700e+001
32	8.766e+000	8.654e+000	1.396e+000	1.100e+000	3.100e+001	8.900e+001
33	7.337e+000	7.274e+000	9.610e-001	9.215e-001	3.200e+001	9.100e+001
34	5.831e+000	5.798e+000	6.145e-001	7.324e-001	3.300e+001	9.300e+001
35	5.574e+000	5.555e+000	4.656e-001	6.994e-001	3.400e+001	9.500e+001
36	4.962e+000	4.953e+000	3.040e-001	6.234e-001	3.500e+001	9.700e+001
37	3.948e+000	3.939e+000	2.647e-001	4.954e-001	3.600e+001	9.900e+001
38	3.987e+000	3.985e+000	1.262e-001	5.009e-001	3.700e+001	1.010e+002
39	3.405e+000	3.405e+000	0.723e-001	4.275e-001	3.800e+001	1.030e+002
40	2.898e+000	2.898e+000	0.000e+000	3.642e-001	3.900e+001	1.050e+002
41	2.857e+000	2.853e+000	1.393e-001	3.589e-001	4.000e+001	1.070e+002
42	3.003e+000	2.947e+000	5.728e-001	3.770e-001	4.100e+001	1.090e+002
43	3.157e+000	2.947e+000	1.133e+000	3.967e-001	4.200e+001	1.110e+002
44	2.663e+000	2.398e+000	1.157e+000	3.342e-001	4.300e+001	1.130e+002
45	2.290e+000	1.969e+000	1.135e+000	2.874e-001	4.400e+001	1.150e+002
46	2.477e+000	2.312e+000	8.892e-001	3.106e-001	4.500e+001	1.160e+002
47	2.705e+000	2.249e+000	1.504e+000	3.354e-001	4.600e+001	1.180e+002
48	2.911e+000	2.580e+000	1.347e+000	3.653e-001	4.700e+001	1.200e+002
49	3.417e+000	3.001e+000	1.634e+000	4.284e-001	4.800e+001	1.220e+002
50	3.687e+000	3.239e+000	1.761e+000	4.625e-001	4.900e+001	1.240e+002

A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

	ETA*	ETA'	ETA''	TORQUE	TIME	TEMP
	POISE	POISE	POISE	GRAMS-CM	MIN.	DEG. C
1	4.786e+000	4.450e+000	1.759e+000	5.999e-001	5.000e+001	1.260e+002
2	3.464e+000	3.193e+000	1.343e+000	4.344e-001	5.100e+001	1.280e+002
3	6.979e+000	6.453e+000	2.657e+000	8.741e-001	5.200e+001	1.300e+002
4	1.003e+001	9.418e+000	3.457e+000	1.258e+000	5.300e+001	1.310e+002
5	1.616e+001	1.532e+001	5.138e+000	2.025e+000	5.400e+001	1.330e+002

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OF POOR QUALITY

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2



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Rheometrics RECAP II

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Experiment No. : 7      Sample No. : 1

Test :  
NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

Generator : CP

Date and Time : Monday, August 18, 1986 - 13:42:09

Operating Mode : DYNAMIC

Sample Type : CURE

Geometry : DISK & PLATE  
RADIUS : 25.00  
GAP : 0.50

Strain :  
Strain = 50%  
Frequency = 10 RAD/SEC

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OF POOR QUALITY

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

N.J.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	4.660e+003	4.659e+003	9.050e+001	5.983e+002	2.000e-001	3.000e+001
2	4.371e+003	4.371e+003	6.109e+001	5.612e+002	1.000e+000	3.100e+001
3	3.598e+003	3.598e+003	5.110e+001	4.600e+002	2.000e+000	3.300e+001
4	2.798e+003	2.797e+003	3.594e+001	3.569e+002	3.000e+000	3.500e+001
5	2.107e+003	2.107e+003	3.108e+001	2.679e+002	4.000e+000	3.700e+001
6	1.583e+003	1.583e+003	3.224e+001	2.006e+002	5.000e+000	3.900e+001
7	1.150e+003	1.190e+003	3.339e+001	1.505e+002	6.000e+000	4.100e+001
8	8.865e+002	8.859e+002	3.148e+001	1.118e+002	7.000e+000	4.300e+001
9	6.653e+002	6.647e+002	2.780e+001	8.325e+001	8.000e+000	4.400e+001
10	5.079e+002	5.071e+002	2.798e+001	6.388e+001	9.000e+000	4.600e+001
11	3.852e+002	3.844e+002	2.502e+001	4.841e+001	1.000e+001	4.800e+001
12	2.984e+002	2.975e+002	2.327e+001	3.747e+001	1.100e+001	5.000e+001
13	2.342e+002	2.331e+002	2.289e+001	2.939e+001	1.200e+001	5.200e+001
14	1.840e+002	1.827e+002	2.245e+001	2.306e+001	1.300e+001	5.400e+001
15	1.473e+002	1.458e+002	2.022e+001	1.848e+001	1.400e+001	5.600e+001
16	1.183e+002	1.167e+002	1.911e+001	1.484e+001	1.500e+001	5.800e+001
17	9.661e+001	9.513e+001	1.623e+001	1.211e+001	1.600e+001	6.000e+001
18	7.932e+001	7.792e+001	1.482e+001	9.949e+000	1.700e+001	6.200e+001
19	6.663e+001	6.543e+001	1.260e+001	8.349e+000	1.800e+001	6.400e+001
20	5.676e+001	5.578e+001	1.050e+001	7.120e+000	1.900e+001	6.600e+001
21	4.854e+001	4.761e+001	9.465e+000	6.078e+000	2.000e+001	6.800e+001
22	4.177e+001	4.119e+001	6.924e+000	5.237e+000	2.100e+001	7.000e+001
23	3.651e+001	3.587e+001	6.826e+000	4.579e+000	2.200e+001	7.200e+001
24	3.142e+001	3.086e+001	5.898e+000	3.941e+000	2.300e+001	7.400e+001
25	2.703e+001	2.655e+001	5.087e+000	3.352e+000	2.400e+001	7.600e+001
26	2.308e+001	2.266e+001	4.377e+000	2.874e+000	2.500e+001	7.800e+001

27	2.043e+001	2.006e+001	3.677e+000	2.564e+000	2.600e+001	2.000e+001
28	1.845e+001	1.810e+001	3.730e+000	2.317e+000	2.700e+001	2.100e+001
29	1.622e+001	1.590e+001	3.207e+000	2.036e+000	2.800e+001	2.300e+001
30	1.393e+001	1.366e+001	2.742e+000	1.747e+000	2.900e+001	2.500e+001
31	1.222e+001	1.199e+001	2.325e+000	1.533e+000	3.000e+001	2.700e+001
32	1.063e+001	1.038e+001	2.294e+000	1.332e+000	3.100e+001	2.900e+001
33	9.435e+000	9.306e+000	1.554e+000	1.183e+000	3.200e+001	3.100e+001
34	7.880e+000	7.823e+000	9.476e-001	9.897e-001	3.300e+001	3.300e+001
35	6.772e+000	6.706e+000	9.418e-001	8.497e-001	3.400e+001	3.500e+001
36	5.496e+000	5.459e+000	6.397e-001	6.900e-001	3.500e+001	3.700e+001
37	4.882e+000	4.831e+000	4.551e-001	6.127e-001	3.600e+001	3.900e+001
38	4.092e+000	4.089e+000	1.699e-001	5.140e-001	3.700e+001	4.100e+001
39	3.417e+000	3.417e+000	0.000e+000	4.292e-001	3.800e+001	4.300e+001
40	2.973e+000	2.954e+000	3.373e-001	3.735e-001	3.900e+001	4.500e+001
41	2.970e+000	2.929e+000	4.913e-001	3.727e-001	4.000e+001	4.700e+001
42	3.516e+000	3.200e+000	1.458e+000	4.412e-001	4.100e+001	4.900e+001
43	4.011e+000	3.256e+000	2.343e+000	5.040e-001	4.200e+001	5.100e+001
44	3.159e+000	2.754e+000	1.547e+000	3.966e-001	4.300e+001	5.300e+001
45	3.304e+000	2.921e+000	1.544e+000	4.144e-001	4.400e+001	5.500e+001
46	2.910e+000	2.125e+000	1.588e+000	3.649e-001	4.500e+001	5.700e+001
47	2.898e+000	2.125e+000	1.971e+000	3.637e-001	4.600e+001	5.900e+001
48	3.698e+000	2.828e+000	2.383e+000	4.639e-001	4.700e+001	6.100e+001
49	4.482e+000	3.486e+000	2.817e+000	5.620e-001	4.800e+001	6.300e+001
50	5.299e+000	4.021e+000	3.451e+000	6.639e-001	4.900e+001	6.500e+001

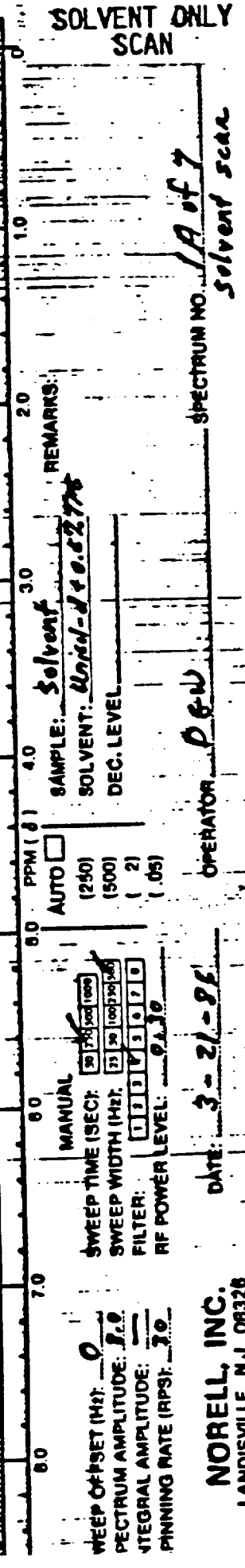
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# 55" FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LDT1-2

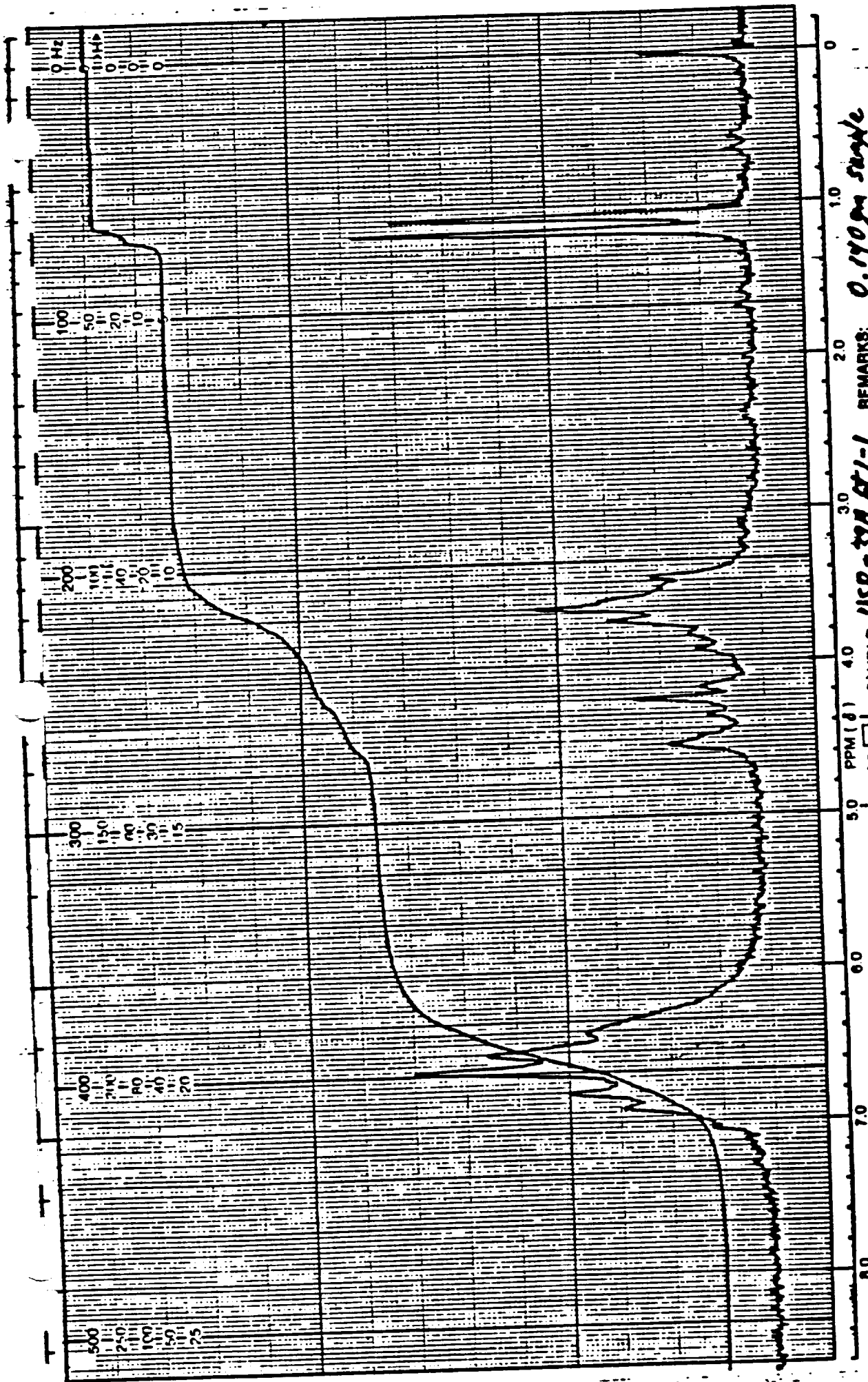
NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	5.075e+000	4.159e+000	2.908e+000	6.364e-001	5.000e+001	1.270e+002
52	4.836e+000	3.218e+000	3.610e+000	6.067e-001	5.100e+001	1.290e+002
53	6.447e+000	5.135e+000	3.898e+000	8.098e-001	5.200e+001	1.310e+002
54	1.123e+001	9.521e+000	5.956e+000	1.411e+000	5.300e+001	1.330e+002
55	1.413e+001	1.201e+001	7.434e+000	1.773e+000	5.400e+001	1.350e+002

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081



REMARKS: 0.140 gm sample  
0.698 gm solvent

SAMPLE: USP-39A #1-1

SOLVENT: Diethyl-d<sub>10</sub> 2770

DEC. LEVEL

ORIGINAL  
OF POOR

PAGE  
QUALIT

AUTO

(250)

(500)

(1000)

MANUAL

SWEEP TIME (SEC): 1.0

SWEEP WIDTH (Hz): 100

FILTER: 1.0

RF POWER LEVEL: 0.25

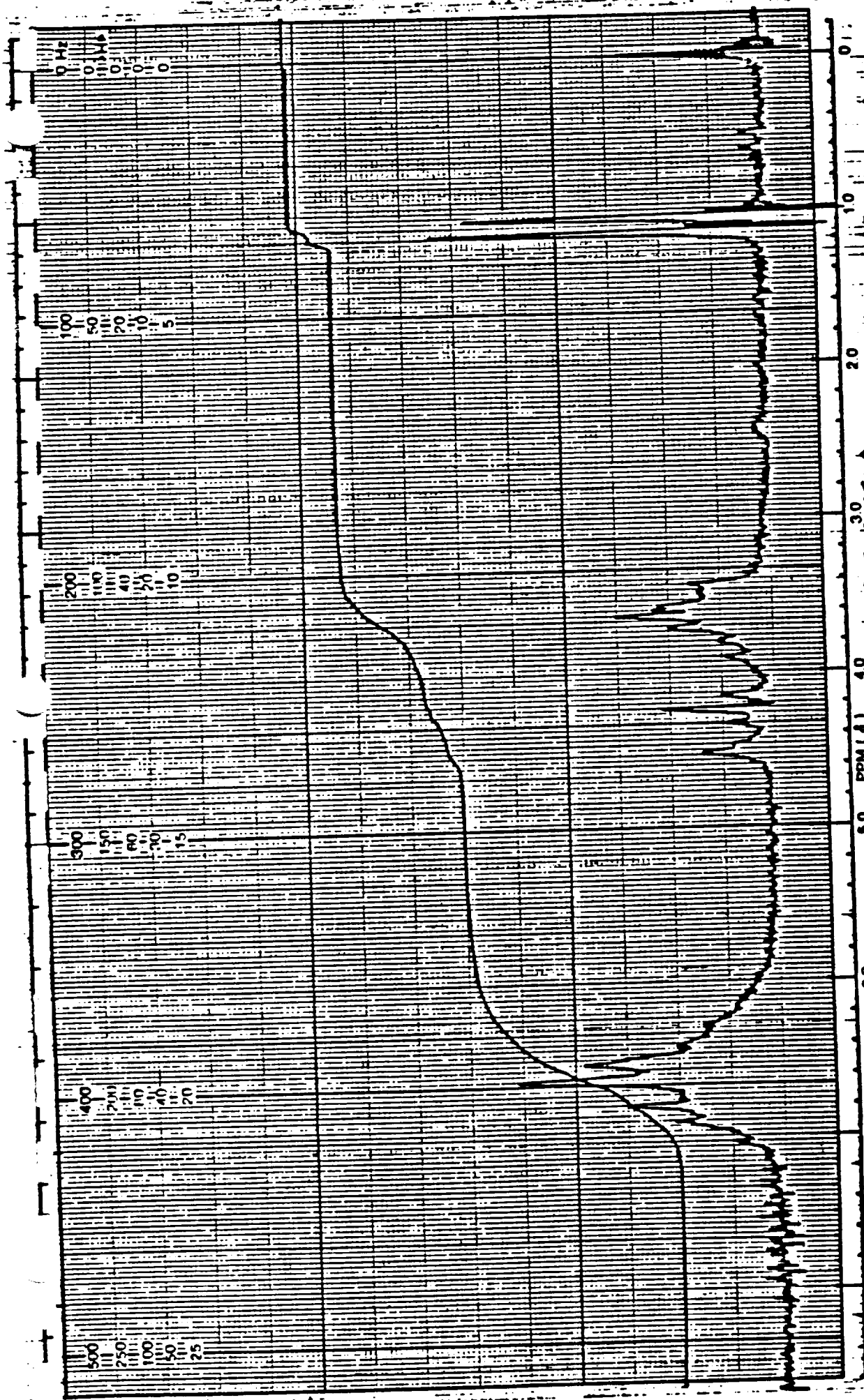
SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 1.0  
INTEGRAL AMPLITUDE: 5.0  
SPINNING RATE (RPS): 3.0

OPERATOR DGM

DATE: 3-21-96

NORELL, INC.  
LANDISVILLE, N.J. 08328  
Phone: (609) 697-0020

1067 USP-39A  
#1-1



REMARKS: 0.099 gm sample  
0.817 gm solvent

SAMPLE: USP-39A LAF-1-2  
SOLVENT: Chloro-d + 0.5% TMS  
DEC. LEVEL: \_\_\_\_\_

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DATE: 3-21-86  
OPERATOR: D.C.W.

SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 2.0  
INTEGRAL AMPLITUDE: 5.0  
SPINNING RATE (RPS): 30

MANUAL  
SWEEP TIME (SEC): 30  
SWEEP WIDTH (Hz): 25  
FILTER: 133173070  
RF POWER LEVEL: 0.25

# TABLE OF CONTENTS

## FABRIC TESTING

NASB-36298

U.S. Polymeric D.E. 71108

WCA Fabric for NASA Lot# 1 (KAISER)

<u>TEST</u>	<u>PAGE</u>
1a. Breaking Strength, WARP.....	1
1b. Breaking Strength, FILL.....	1
2a. Carbon Assay.....	1
2b. Hydrogen Assay.....	1
2c. Nitrogen Assay.....	1
3. Visual Inspection.....	1
4. Specific Gravity.....	1
5. pH.....	1
6. TGA.....	2
7a. Atomic Absorption.....	2
7b. Moisture Content.....	2
7c. Ash Content.....	2
8a. Filament diameter, WARP.....	2
9a. Thread Count, WARP.....	2
9b. Thread Count, FILL.....	2
10a. Areal weight.....	2
10b. Volatiles.....	3
10c. Weight Change on Acetone Wash.....	3

## CHARTS

Visual Inspection.....	3B
TGA.....	6A



## FABRIC TESTING

NAS8-36298

U.S. POLYMERIC D.E. 71108

WCA Fabric for NASA Lot# 1 (KAISER)

1a. Breaking Strength, lbs/in, WARP ASTM D1682	<u>#1-2E</u> PICK 77 CENTER 70 PLAIN 70 AVG. 72.3
1b. Breaking Strength, lbs/in, FILL ASTMD 1682	PICK 23 CENTER 22 PLAIN 24 AVG. 23.3
2a. Carbon Assay, % MDQAI 5560	PICK 99.9 CENTER 99.9 PLAIN 99.4 AVG. 99.73
2b. Hydrogen Assay, % MDQAI 5560	PICK <.01 CENTER <.01 PLAIN <.01 AVG. EST .001
2c. Nitrogen Assay, % MDQAI 5560	PICK .10 CENTER .10 PLAIN .10 AVG. .10
3. Visual Inspection QC1-102	See Chart 3B
4. Specific Gravity, Units PTH-84	1.7139 1.7196 <u>1.7239</u> AVG. 1.719
5. pH, Units CTH-24B	6.5 <u>6.5</u> AVG. 6.5

WCA Fabric for NASA Lot# 1 (KAISER)

6. TGA, °C at 50% Weight Loss  
CTH-51 (AIR)

SET UP# 2  
#1-2E 859

See Chart 6A

7a. Atomic Absorption, ppm  
CTH-53B

#1-2E  
Na 25  
K 1  
Ca 7  
Mg 1  
Li 0  
AVG. 34

7b. Moisture Content, %  
CTH-53B

.035

7c. Ash Content, %  
CTH-53

.010

8a. Filament diameter, microns, WARP  
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE 11.72  
Minimum 9.55  
Maximum 15.55  
Std. Dev 1.78

9a. Thread Count, per inch, WARP  
PTH-5A

#1-2E  
29  
29  
29  
29  
29  
29  
AVG. 29.0

9b. Thread Count, per inch, FILL  
PTH-5A

22  
22  
22  
22  
22  
22  
AVG. 22.0

10a. Areal Weight as received, gm/4x4  
PTH-3A

LEFT 2.575  
CENTER 2.549  
RIGHT 2.561  
AVG. 2.562

WCA Fabric for NASA Lot# 1 (KAISER)

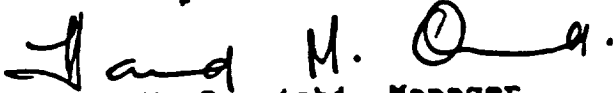
10b. Volatiles as received, %  
PTM-3A

	<u>#1-2E</u>
LEFT	.43
CENTER	.43
RIGHT	<u>.66</u>
AVG.	.51

10c. Weight change on Acetone wash, %  
PTM-3A

LEFT	.35
CENTER	-.04
RIGHT	<u>.55</u>
AVG.	.29

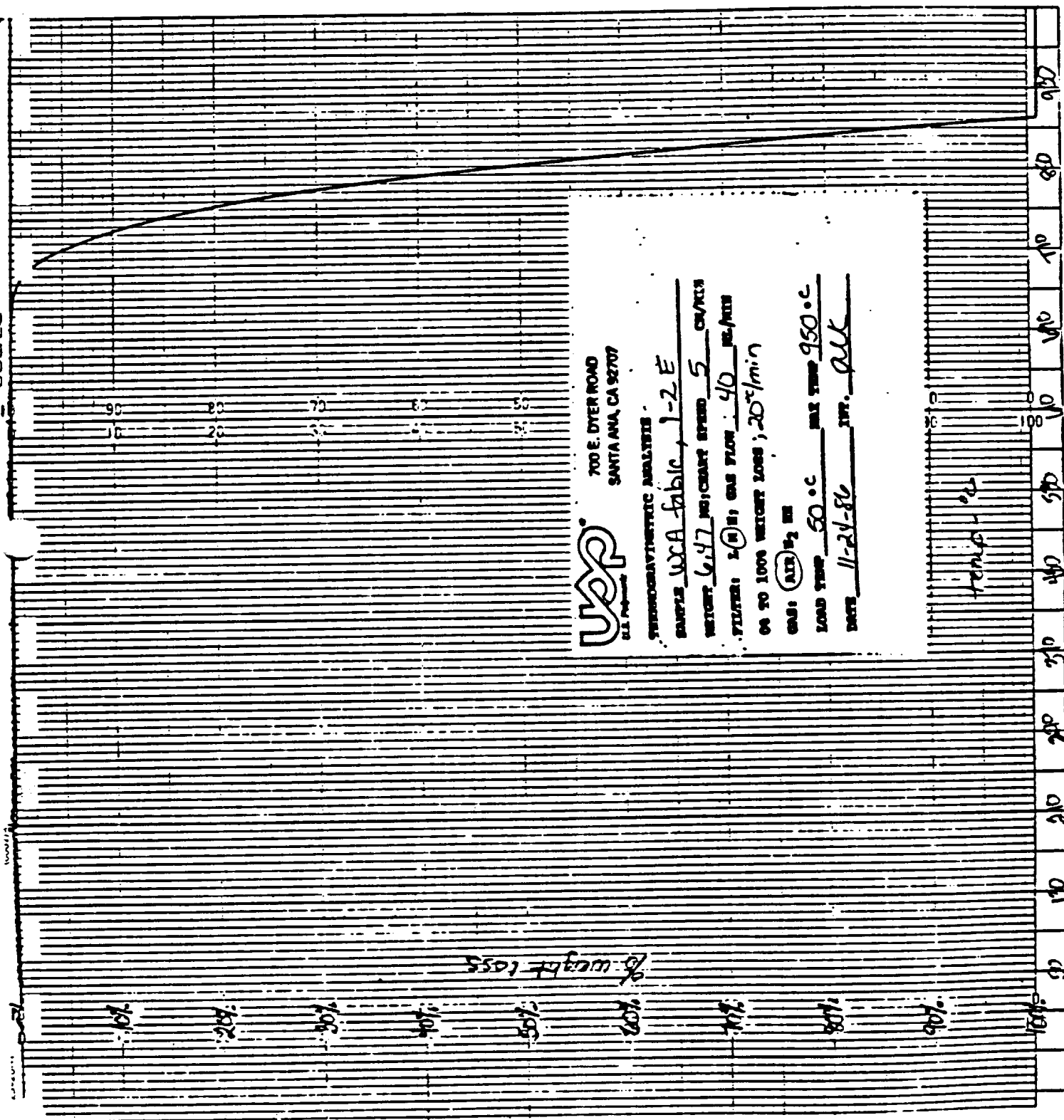
U.S. Polymeric

  
Haid M. Quraishi, Manager  
Quality Assurance Department

484 2  
478 4  
485 6 PLICE  
492 4  
506 4  
510 5



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# TABLE OF CONTENTS

## PREPREG TESTING

NASB-36298

U.S. Polymeric D.E. 71108

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

<u>TEST</u>	<u>PAGE</u>
1a. Resin Content, Soxhlet.....	1
1b. Filler Content, Soxhlet.....	1
1c. Cloth Content, Soxhlet.....	1
2. Volatile Content.....	1
3. Flow.....	1
4. Resin Content, Dry Basis.....	1
5. Tack.....	1
6. Gel Time.....	1
7a. Atomic Absorption.....	1
7b. Moisture Content.....	1
7c. Ash Content.....	2
8. TGA.....	2
9. DSC.....	2
10. Infrared (IRZB) Baseline.....	2
11. Environmental History.....	2
12. Specific Gravity.....	2
13a. Tensile Strength.....	2
13b. Tensile Modulus.....	2
13c. Tensile Elongation.....	2
14a. Flexural Strength.....	2
14b. Flexural Modulus.....	3
15a. Compressive Strength.....	3
15b. Compressive Modulus.....	3
16. Double Shear Strength.....	3
17. Barcol Hardness.....	3
18. Residual Volatiles.....	3
19. Resin Content, Pyrolysis.....	3
20. Acetone Extraction.....	3
21a. CTE, with ply.....	3
21b. CTE, crossply.....	4

## CHARTS

TGA.....	8A
DSC.....	9A
Infrared (IRZB) Baseline.....	10A
CTE .....	21A



## PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

		ROLL#1-S
1a. Resin Content, Soxhlet, % CTM-6D		33.0
		32.1
		<u>32.8</u>
	AVG.	32.6
1b. Filler Content, Soxhlet, % CTM-6D		13.5
		13.2
		<u>13.5</u>
	AVG.	13.4
1c. Cloth Content, Soxhlet, % CTM-6D		53.5
		54.7
		<u>53.7</u>
	AVG.	54.0
2. Volatile Content, % PTM-17B		2.5
		2.3
		<u>2.0</u>
	AVG.	2.3
3. Flow, 1000 psi, % PTM-19G		13.9
		14.2
		<u>13.6</u>
	AVG.	13.9
4. Resin Content, Dry basis, % PTM-16F, Type II		34.4
		34.0
		<u>34.8</u>
	AVG.	34.4
5. Tack, lbs PTM-80		26
6. Gel Time, seconds PTM-20E		34
7a. Atomic Absorption, ppm CTM-53B	Na	1
	K	0
	Ca	0
	Mg	3
	Li	<u>0</u>
	TOTAL	4
7b. Moisture Content, % CTM-53B		1.76

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

7c. Ash Content, % CTM-53B		<u>ROLL#1-S</u> .16
8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)	See Chart 8A	8.9
9. DSC, °C CTM-50A	First Temp See Chart 9A	182
10. Infrared (IR2B) Baseline CTM-21C		.82  See Chart 10A
11. Environmental History	Date manufactured: 1 May 1986 Packaged in: MIL-B-131 Class I bag supported in cardboard carton Date shipped: 16 June 1986 in 40°F truck	
12. Specific Gravity, Cured, Units ASTM D792		1.429 1.430 <u>1.430</u> AVG. 1.429
13a. Tensile Strength, ksi, WARP FTMS 406-1011		20.89 20.75 20.00 20.68 <u>20.75</u> AVG. 20.61
13b. Tensile Modulus, ksi, WARP FTMS 406-1011		1.98 1.95 1.87 2.02 <u>1.99</u> AVG. 1.96
13c. Tensile Elongation, %, WARP FTMS 406-1011		1.44 1.49 1.47 1.49 <u>--</u> AVG. 1.47
14a. Flexural Strength, ksi, WARP FTMS 406-1031		27.43 28.15 29.32 30.28 <u>27.80</u> AVG. 28.60

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

		<u>ROLL#1-S</u>
14b. Flexural Modulus, ksi, WARP		1.68
FTMS 406-1031		1.75
		1.88
		1.72
		<u>1.69</u>
	AVG.	1.74
15a. Compressive Strength, ksi, WARP		11.17
FTMS 406-1021		15.10
		14.52
		12.76
		<u>18.04</u>
	AVG.	14.32
15b. Compressive Modulus, ksi, WARP		2.62
FTMS 406-1021		2.51
		2.53
		2.31
		<u>2.57</u>
	AVG.	2.51
16. Double Shear Strength, ksi		2.61
FTMS 406-1041A		2.68
		2.56
		2.70
		<u>2.68</u>
	AVG.	2.64
17. Barcol Hardness, Units		61.5
ASTM D-2583		
(Average of 10 determinations)		
18. Residual Volatiles, %		.99
PTM-98		.97
		<u>1.16</u>
	AVG.	1.04
19. Resin Content, Pyrolysis, %		31.32
CTM-14B		30.52
		<u>31.61</u>
	AVG.	31.15
20. Acetone Extraction, %		5.00
CTM-18A		5.12
		<u>5.76</u>
	AVG.	5.29
21a. CTE, in/in °F with PLY		3.29
PTM-61B		<u>1.59</u>
	AVG.	2.44

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

21b. CTE, 1n/in •F Cross PLY  
PTM-61B

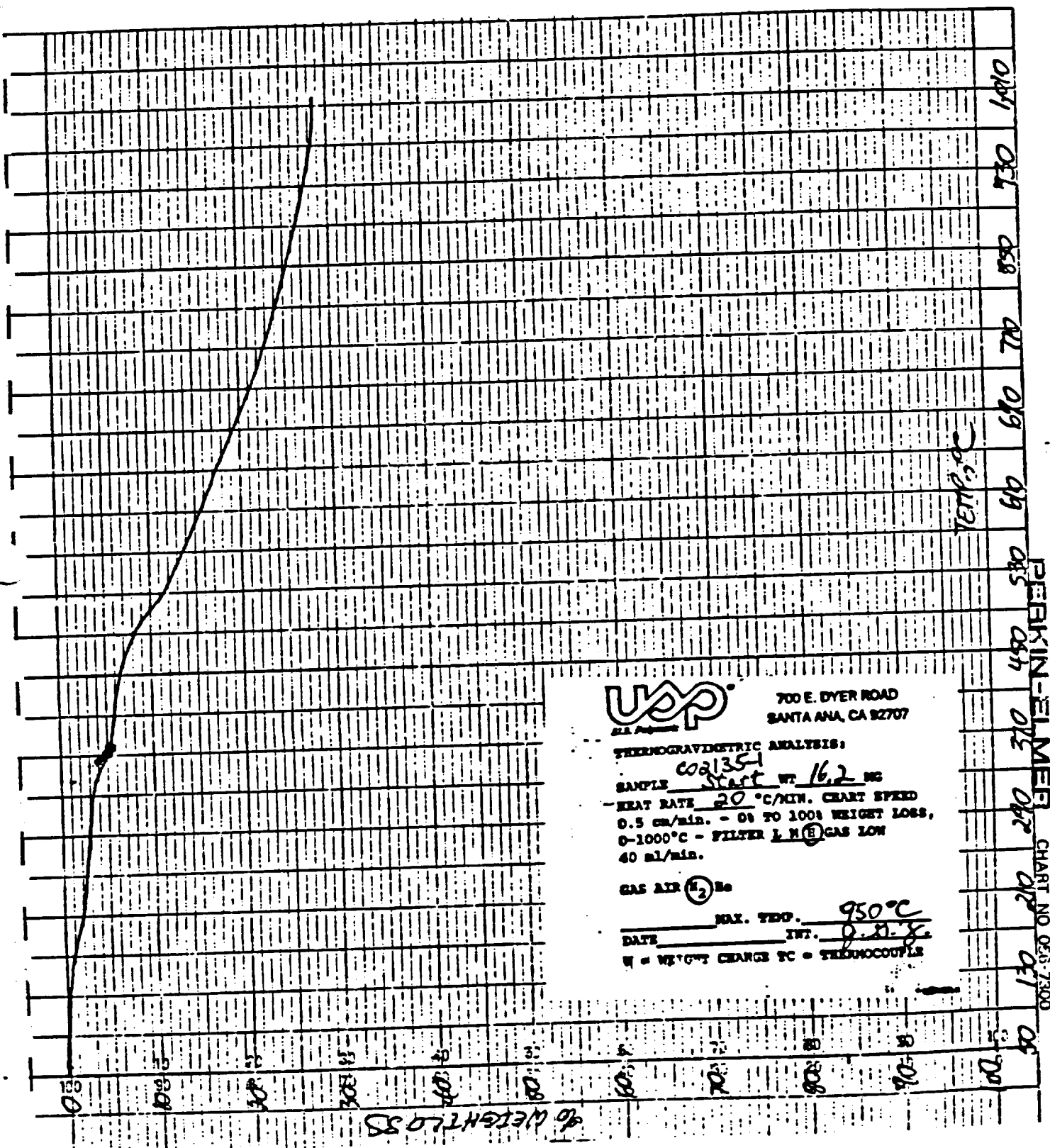
	9.40
	<u>8.11</u>
AVG.	8.76

See Chart 21A

U.S. Polymeric

  
Hamid M. Quraishi, Manager  
Quality Assurance Department

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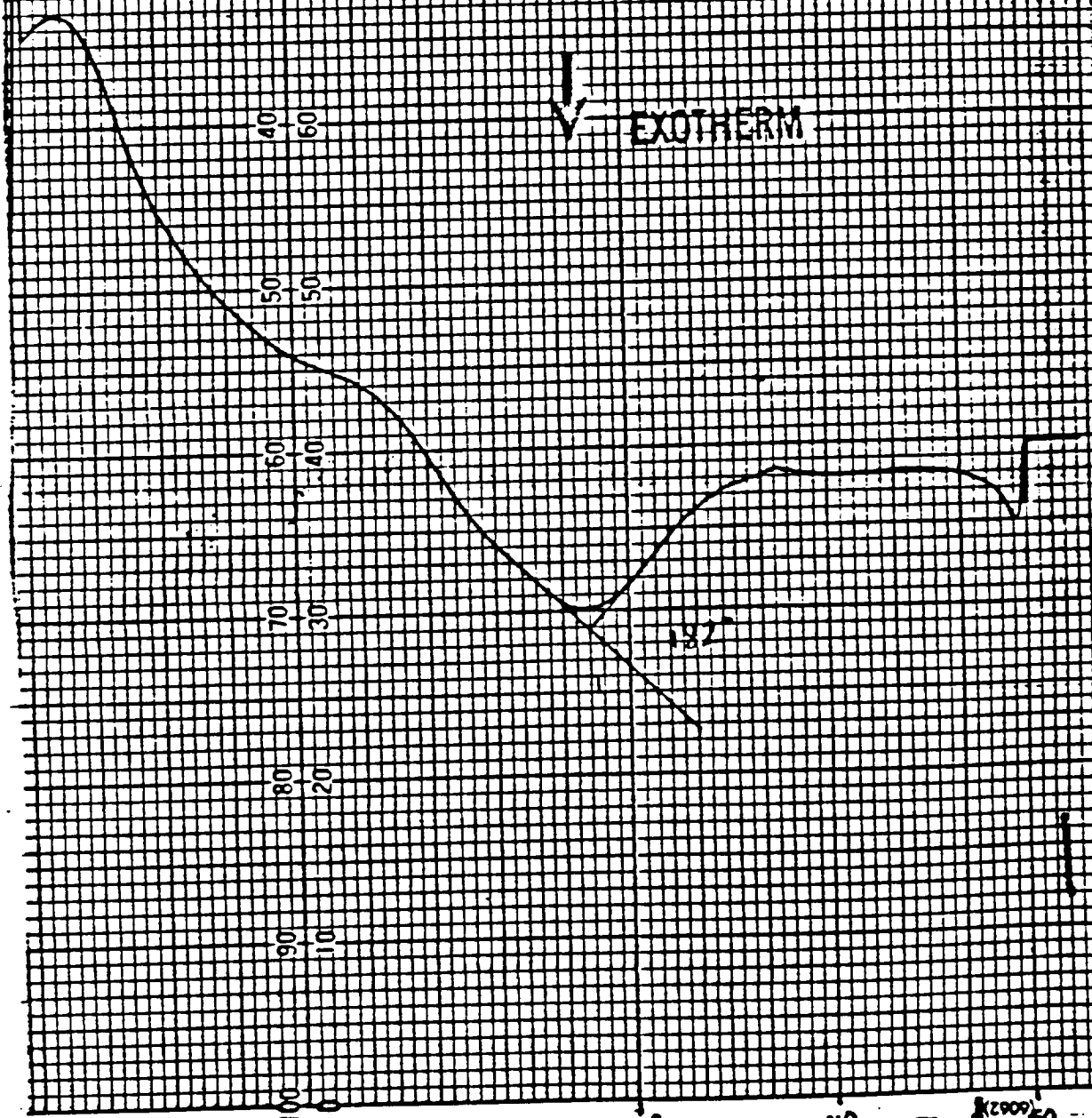


PLS POLYMER C-880-2

Sample 00235-1300  
 Final Rate 20  
 Sample Span 50  
 Limits Lower 50  
 Upper 850  
 Cooling Rate 10  
 Date 9-17-86

9-15-86 LAST CALIBRATION DATE  
 AVG OF CALIBRATION DELTA °C

↓  
 EXOTHERM



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## WAVELENGTH IN MICRONS

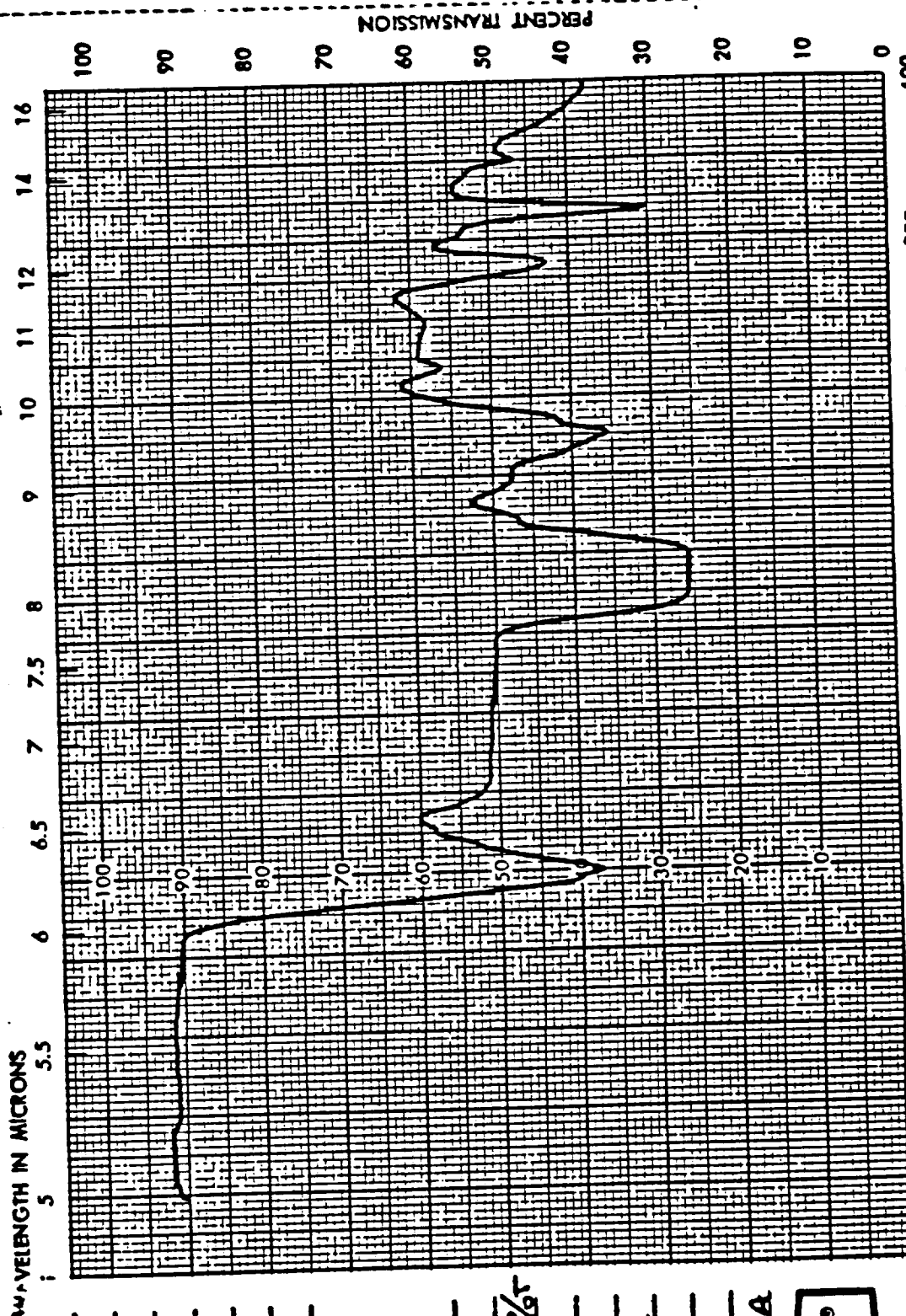
SPECTRUM NO. 15185  
DATE 7-07-86  
SAMPLE FM 5064.1  
CO2135 #1  
  
  
SOURCE \_\_\_\_\_  
STRUCTURE \_\_\_\_\_

PATH 0.2 mm NaCl  
SOLVENT ACETONE  
CONCENTRATION 30-50%  
PHASE 3  
COMMENTS PRE-PREG  
WATERPLOT

ANALYST Y. MURAYDA

# Beckman®

**INFRARED  
SPECTROPHOTOMETER**



**ROCKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.**

WAVENUMBER  $\text{CM}^{-1}$

MEASURED VARIABLE

TAXIS		DTA-DSC		TGA		TMA	
SCALE, °C/in	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in	SCALE, mg/in	SCALE, mils/in	SCALE, mils/in	SCALE, mils/in
PROG. RATE, °C/min	(mg/1000)/in	SUPPRESSION, mg	MODE, <u>EXTENDED</u>	MODE, <u>EXTENDED</u>	MODE, <u>EXTENDED</u>	MODE, <u>EXTENDED</u>	MODE, <u>EXTENDED</u>
HEAT, COOL, ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE, <u>0.250</u>	SAMPLE SIZE, <u>0.250</u>	SAMPLE SIZE, <u>0.250</u>	SAMPLE SIZE, <u>0.250</u>	SAMPLE SIZE, <u>0.250</u>
SHIFT, in	REFERENCE	TIME CONST., <u>100</u>	LOAD, <u>0</u>	LOAD, <u>0</u>	LOAD, <u>0</u>	LOAD, <u>0</u>	LOAD, <u>0</u>
		dY, (mg/min)/in	dY, (10X), (mils/min)/in	dY, (10X), (mils/min)/in	dY, (10X), (mils/min)/in	dY, (10X), (mils/min)/in	dY, (10X), (mils/min)/in

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

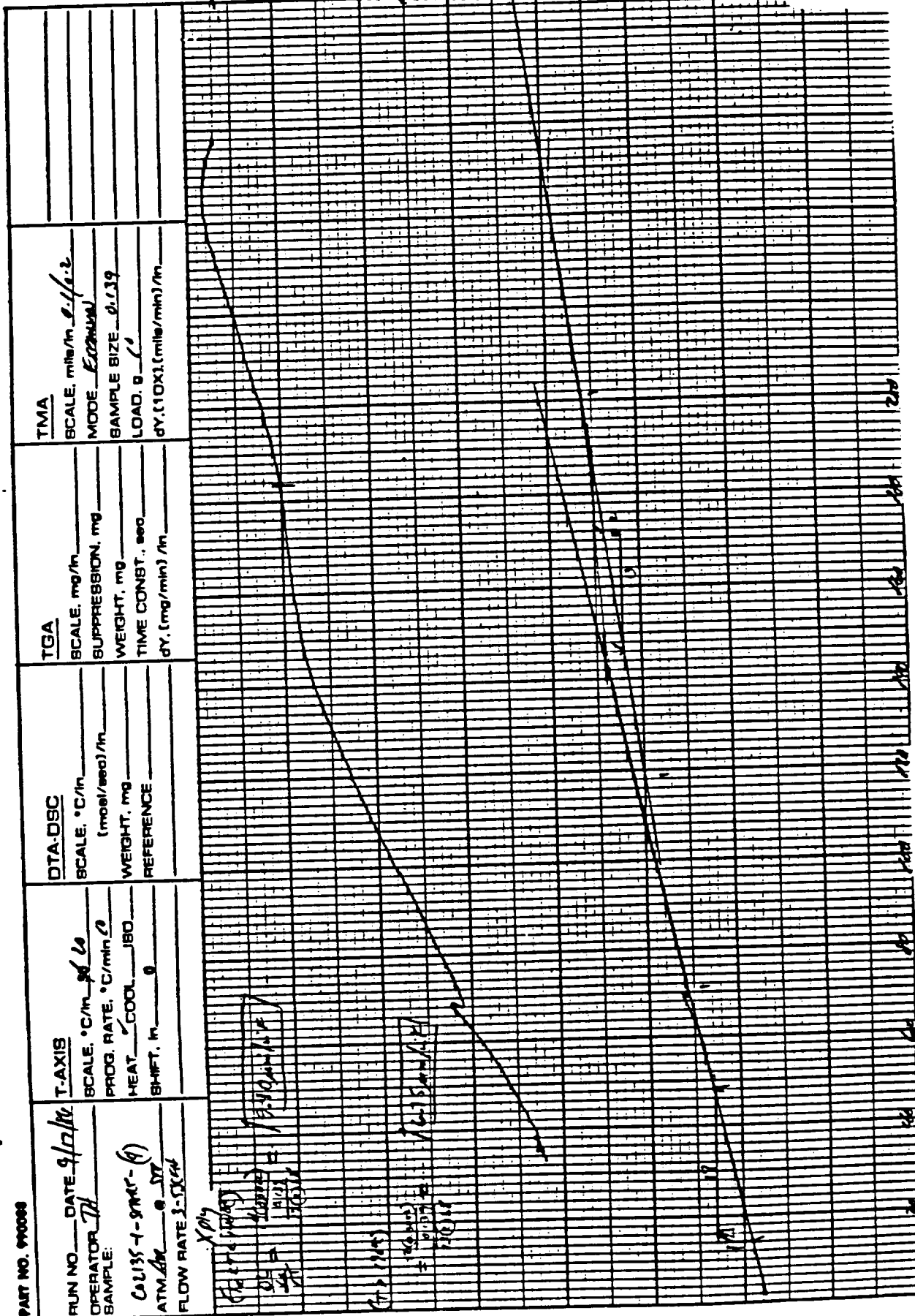
Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.	Date	Operator	Sample	Atm. Pres.	Flow Rate
62135-1-3	3-27-67	W. J. H.	COAL	0.30	1.50

Run No.</
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RUN NO. <u>9/11/84</u> OPERATOR <u>TH</u> SAMPLE: <u>COZISS-1-SPECT-6</u> ATM <u>2nd</u> @ <u>50</u> FLOW RATE <u>3.5x11</u>	T-AXIS SCALE, °C/m <u>20</u> PROG. RATE, °C/min <u>1</u> HEAT <input checked="" type="checkbox"/> COOL <u>180</u> SHIFT, in <u>0</u>	DTA-DSC SCALE, °C/m (mcal/sec)/m WEIGHT, mg REFERENCE	TGA SCALE, mg/m SUPPRESSION, mg WEIGHT, mg TIME CONBT., sec dY, (mg/min)/m	TMA SCALE, mils/in <u>6.1/0.6</u> MODE <u>EXPANSION</u> SAMPLE SIZE <u>0.137</u> LOAD, g <u>2</u> dY, (10X), (mils/min)/m
--	--	---	---	--

**T-AXIS**

SCALE, °C/m 50.72  
 PROG. RATE, °C/min 1  
 HEAT ☒ COOL 180.  
 SHIFT, m 0

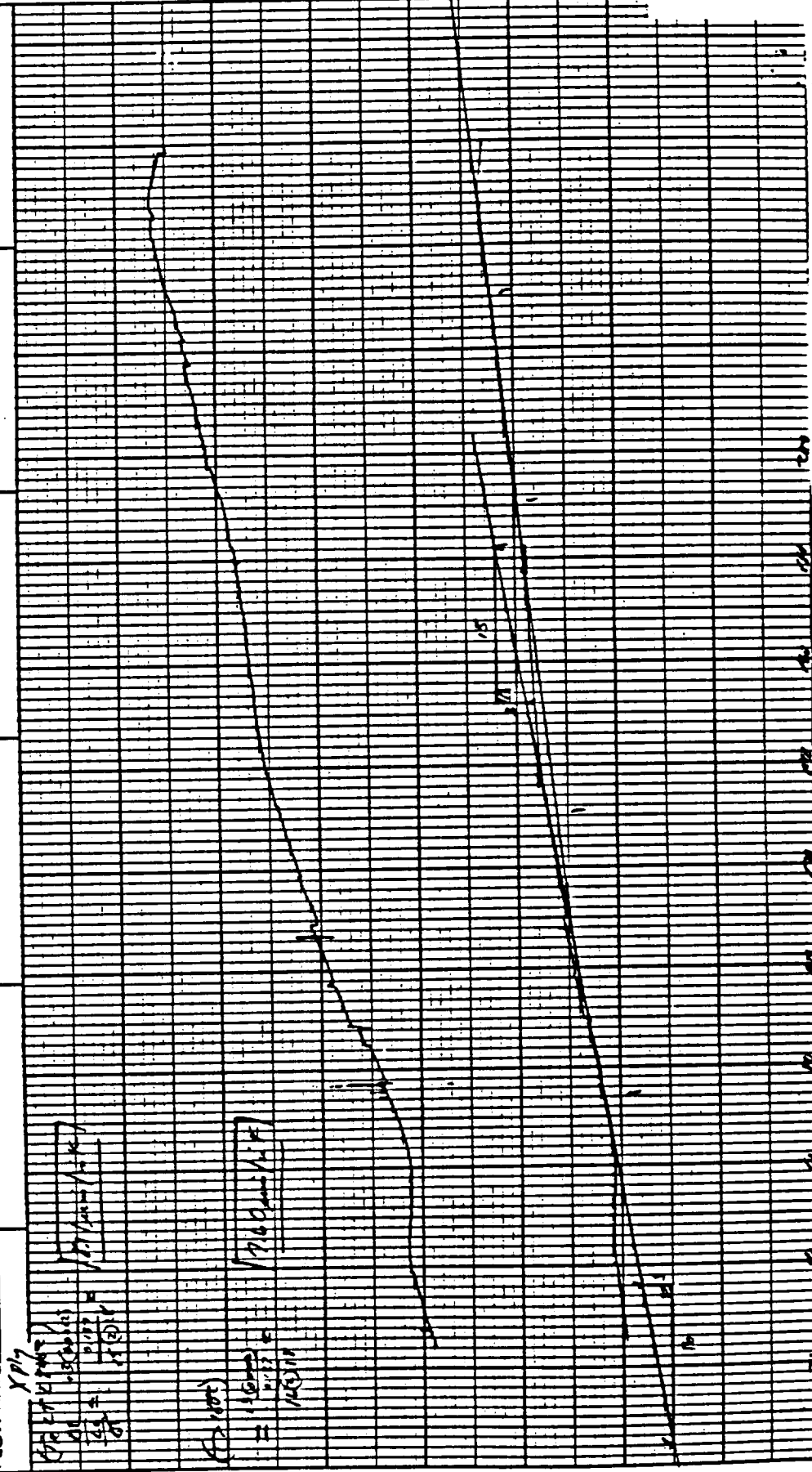
**DTA-DSC**

SCALE, °C/in. \_\_\_\_\_  
 (mol/eq)/in. \_\_\_\_\_  
 WEIGHT, mg \_\_\_\_\_  
 REFERENCE \_\_\_\_\_

SCALE, mg/in. \_\_\_\_\_  
 SUPPRESSION, mg \_\_\_\_\_  
 WEIGHT, mg \_\_\_\_\_  
 TIME CONST., sec. \_\_\_\_\_

TMA

SCALE, miles/hr 6.1/0.6  
MODE EXP/SPN  
SAMPLE SIZE 0.137  
LOAD, g 2



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## FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 2

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2. Ash Content.....	1
3. Atomic Absorption.....	1
3a. Moisture Content.....	1
3b. Ash Content.....	1
4. pH.....	1
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6b. TGA.....	2
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7a. Particle Size, Horiba.....	2

## CHARTS

TGA.....	6A - 6C
Particle Size Distribution.....	7A - 7C



## FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 2

1. Carbon Content, % QAI-5560	SAMPLE			
	#2A-1	#2A-2	#2A-3	
	99.31	99.18	99.40	
	NASA LOT# 2 AVERAGE		99.30	
2. Ash Content, % PTH-71B	0.0	0.0	0.0	
	0.0	0.0	0.0	
	AVG. 0.0	0.0	0.0	
	NASA LOT# 2 AVERAGE		0.0	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)	#2A-1	#2A-2	#2A-3	LOT#2 AVG.
	Na 7.0	7.5	9.0	7.8
	K 1.5	1.0	2.5	1.7
	Ca 2.5	1.5	2.0	2.0
	Mg 0.0	0.0	0.0	0.0
	Li 0.0	0.0	0.0	0.0
	TOTAL 11.0	10.0	13.5	11.5
3a. Moisture Content, % CTM-53B	.041	.034	.039	
	.031	.020	.045	
	AVG. .036	.027	.042	
	NASA LOT# 2 AVERAGE		.035	
3b. Ash Content, % CTM-53B	0.005	0.000	0.015	
	0.000	0.025	0.000	
	AVG. 0.003	0.013	0.008	
	NASA LOT# 2 AVERAGE		0.008	
4. pH, Units ASTM D1512	4.60	4.40	4.50	
	4.60	4.60	4.70	
	AVG. 4.60	4.50	4.60	
	NASA LOT# 2 AVERAGE		4.57	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG. .56	.57	.52	
	Maximum .90	1.25	1.17	
	Minimum .23	.20	.25	
	Std. Dev .22	.28	.24	
	NASA LOT# 2 AVERAGE SIZE		.55	
6a. TGA, °C at 50% Loss CTM-51	842	850	857	
	NASA LOT# 2 AVERAGE		850	

Filler Lot for NASA Lot# 2

6b. TGA  
CTM-51

See Charts 6A-6C

7. Particle Size Distribution  
CTM-72

See Charts 7A-7C

7a. Particle Size, microns  
CTM-72

	<u>#2A-1</u>	<u>#2A-2</u>	<u>#2A-3</u>
	.86	.97	.95
	<u>.85</u>	<u>1.08</u>	<u>.92</u>
AVG.	.86	1.02	.94
NASA LOT# 2	AVERAGE .94		

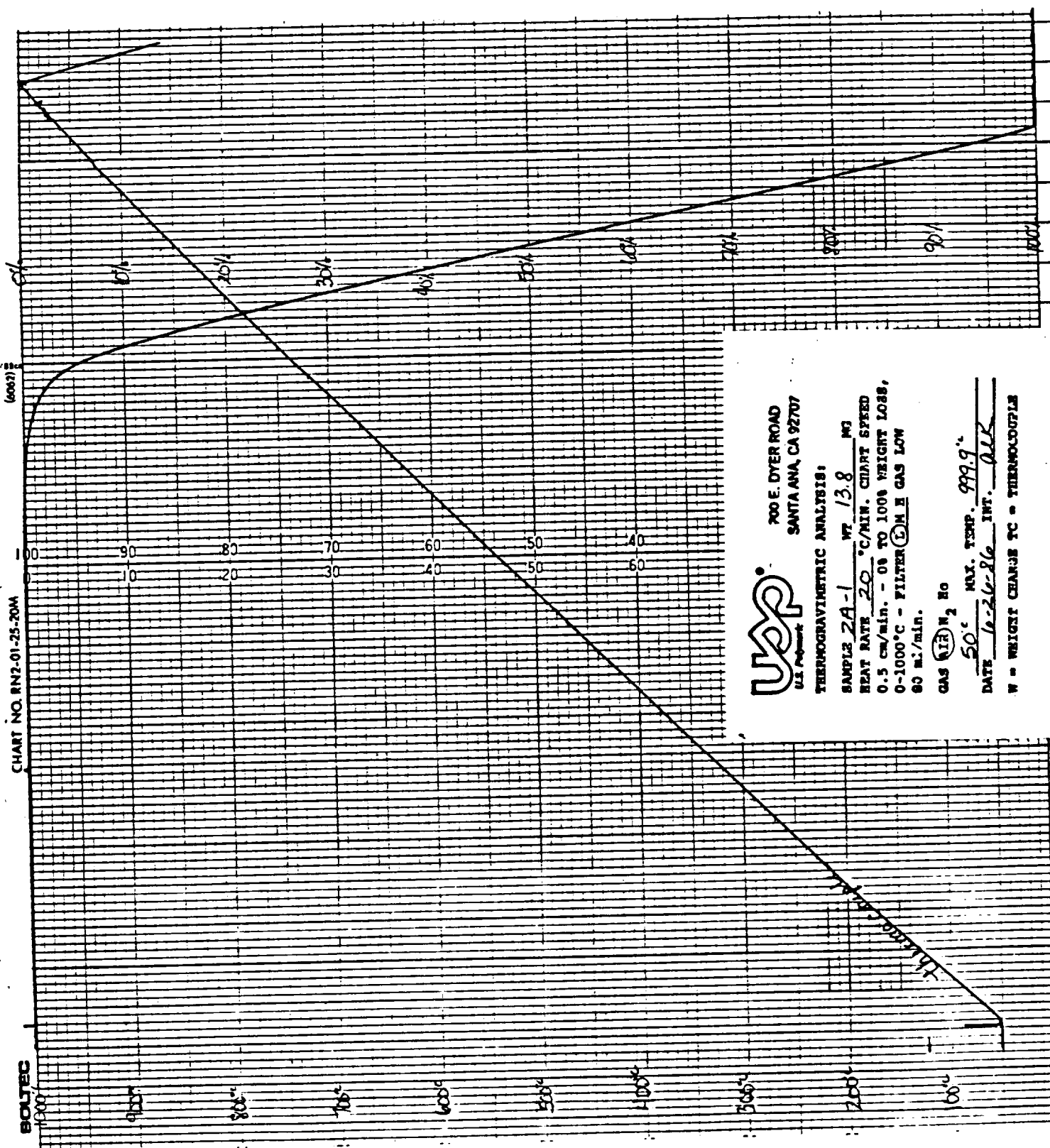
U.S. Polymeric

*Hamid M. Quraishi*

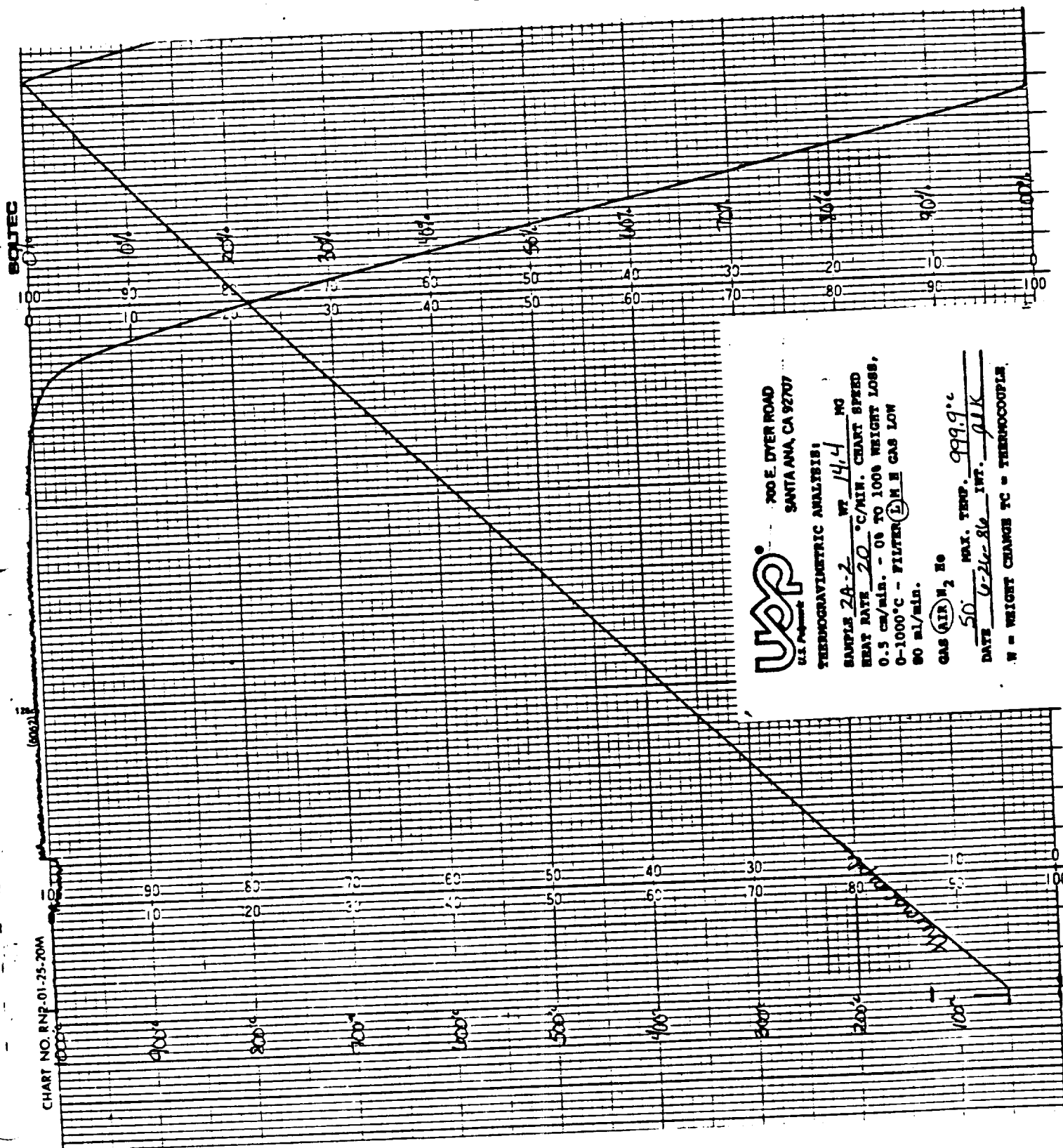
Hamid M. Quraishi, Manager  
Quality Assurance Department



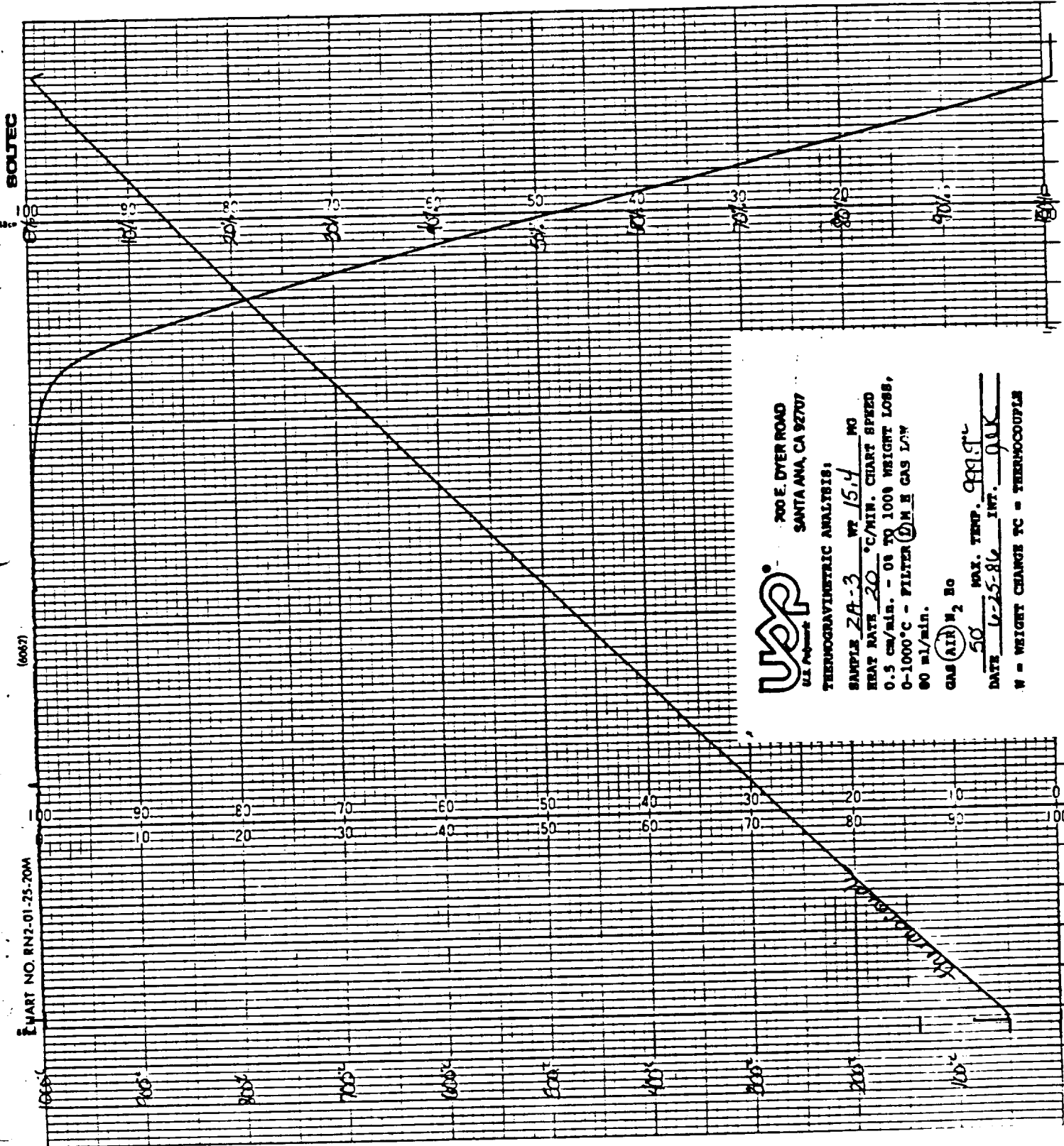
ORIGINAL PROCESSING  
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OF POOR QUALITY



**UAP**  
U.S. PATENT OFFICE

200 E. DYER ROAD  
SANTA ANA, CA 92707

TECHNOGRAPHIC ANALYSIS:

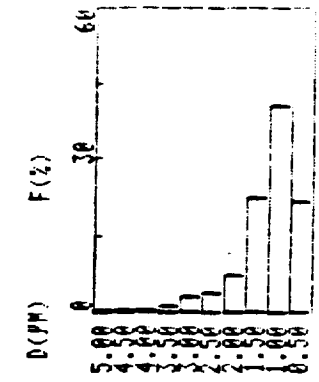
SAMPLE 2A-3 WT 15.4 MG  
HEAT RATE 20 °C/MIN. CHART SPEED  
0.5 CM/MIN. - 08 TO 1008 WEIGHT LOSS,  
0-1000°C - FILTER DM IN GAS 1/4  
90 ml/min.

GAS AIR N<sub>2</sub> 80  
MAX. TEMP. 999.9 °C  
DATE 12-25-86 INT. 9.8  
W = WEIGHT CHANGE TC = THERMOCOUPLE

\* DISTRIBUTION TABLE (BY VOL.)

D (µM)	F (%)	P (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	1.1	1.1
3.00-2.50	3.0	4.1
2.50-2.00	3.8	7.8
2.00-1.50	7.4	15.2
1.50-1.00	22.4	37.6
1.00-0.50	40.8	78.3
0.50-0.00	21.7	100.0
D(AVE)	0.85 (µM)	

\* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-1  
Sample#2

HORIBA CAPA-500  
PARTICLE ANALYZER

DATE 5-24-86  
SAMPLE NASA LOT#2A-1  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

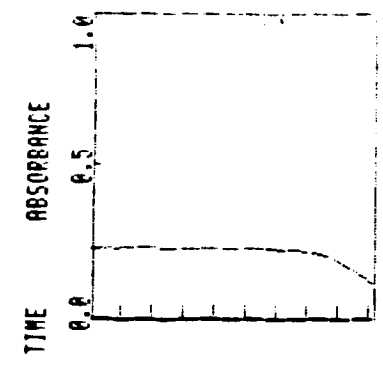
\* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D (MAX) 5.0 (µM)  
D (MIN) 0.01 (µM)  
D (DIV) 0.50 (µM)

SPEED 5000 (RPM)

\* TIME 0 H 11 MIN 31 SEC

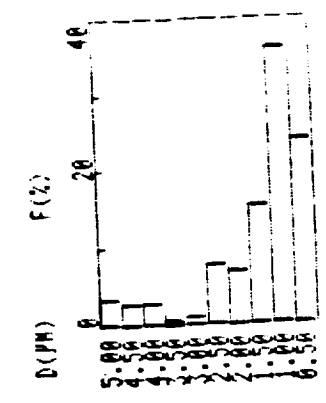
\* DATA



\* DISTRIBUTION TABLE (BY VOL.)

D (µM)	F (%)	P (%)
5.00 <	0.0	0.0
5.00-4.50	3.3	3.3
4.50-4.00	2.6	5.9
4.00-3.50	2.7	8.7
3.50-3.00	0.5	9.2
3.00-2.50	0.9	10.0
2.50-2.00	7.8	17.8
2.00-1.50	7.0	24.7
1.50-1.00	15.2	39.9
1.00-0.50	36.1	76.0
0.50-0.00	24.0	100.0
D(AVE)	0.86 (µM)	

\* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-1  
Sample#1

HORIBA CAPA-500  
PARTICLE ANALYZER

DATE 5-24-86  
SAMPLE NASA LOT#2A-1  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

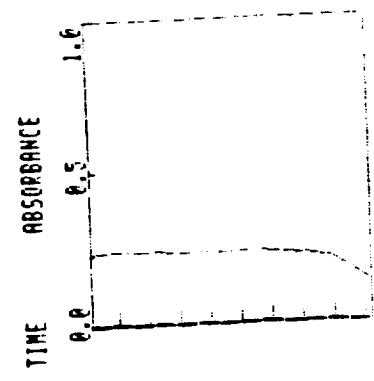
\* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D (MAX) 5.0 (µM)  
D (MIN) 0.01 (µM)  
D (DIV) 0.50 (µM)

SPEED 5000 (RPM)

\* TIME 0 H 11 MIN 31 SEC

\* DATA



ORIGINAL TABLE  
OF POOR QUALITY

CHART 7A

HORIBA CAPA-500  
 PARTICLE ANALYZER  
 DATE 5-24-86  
 SAMPLE NASA LOT#2A-2  
 SOLVENT ETHYL GLYCOL  
 C=0.01 mg/ml

\* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.0	4.5
4.00-3.50	2.8	7.3
3.50-3.00	2.0	9.3
3.00-2.50	5.7	14.9
2.50-2.00	6.1	21.0
2.00-1.50	11.2	32.2
1.50-1.00	21.2	53.5
1.00-0.50	33.0	86.4
0.50-0.00	13.6	100.0

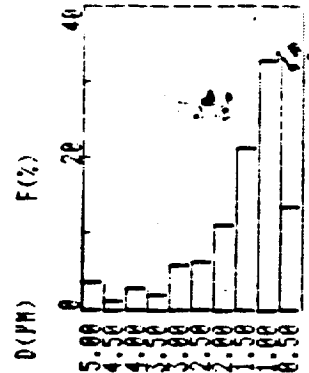
D(AVE) 1.08 (PM)

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\* CONDITIONS

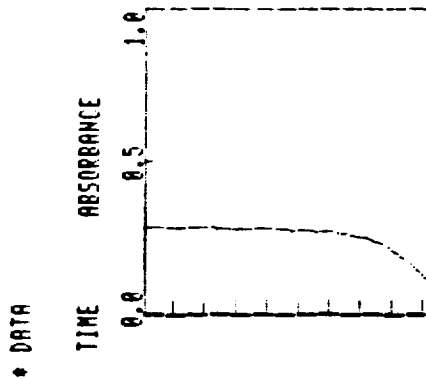
SOLV. VISC 19.90 (CP)  
 SOLV. DENS 1.11 (G/CC)  
 SAMP. DENS 1.90 (G/CC)  
 D(MAX) 5.0 (PM)  
 D(MIN) 0.01 (PM)  
 D(DIV) 0.50 (PM)  
 SPEED 5000. (RPM)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2  
 Sample#1

\* TIME 0 H 11 MIN 31 SEC



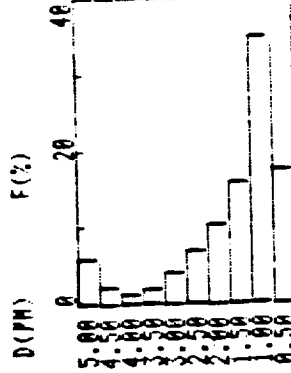
\* DISTRIBUTION TABLE (BY VOL.)

HORIBA CAPA-500  
 PARTICLE ANALYZER  
 DATE 5-24-86  
 SAMPLE NASA LOT#2A-2  
 SOLVENT ETHYL GLYCOL  
 C=0.01 mg/ml

\* CONDITIONS

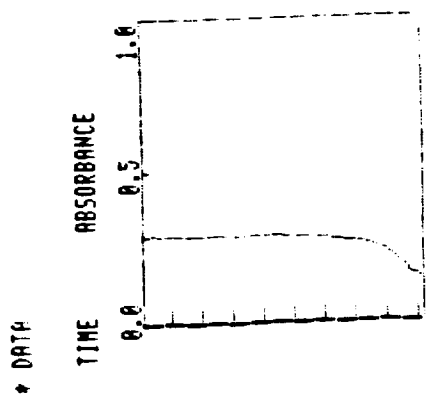
SOLV. VISC 19.90 (CP)  
 SOLV. DENS 1.11 (G/CC)  
 SAMP. DENS 1.90 (G/CC)  
 D(MAX) 5.0 (PM)  
 D(MIN) 0.01 (PM)  
 D(DIV) 0.50 (PM)  
 SPEED 5000. (RPM)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2  
 Sample#1

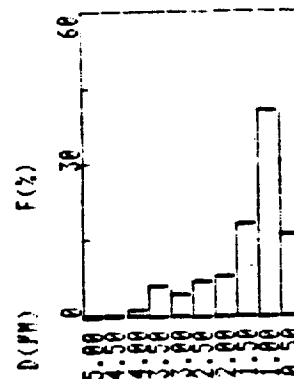
\* TIME 0 H 11 MIN 31 SEC



\* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	1.1	1.1
3.50-3.00	5.8	6.9
3.00-2.50	4.1	11.1
2.50-2.00	6.9	18.0
2.00-1.50	7.7	25.7
1.50-1.00	17.8	43.4
1.00-0.50	40.7	84.1
0.50-0.00	15.9	100.0
D(AVE)		0.92 (PM)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot #2A-3  
Sample #2

HORIBA CAPA-500

PARTICLE ANALYZER

DATE 5-24-86  
SAMPLE NASA LOT #2A-3  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

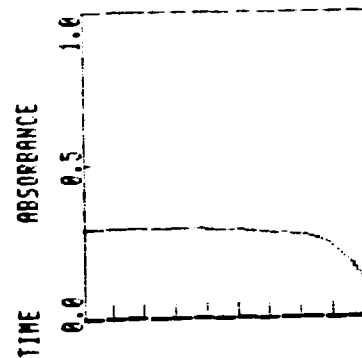
\* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01 (PM)  
D(DIV) 0.50 (PM)

SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

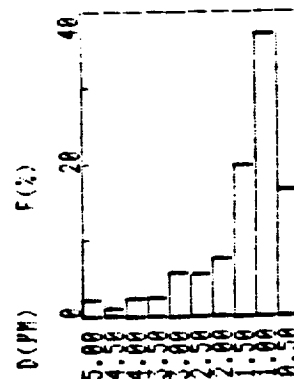
\* DATA



\* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.0	2.0
4.50-4.00	0.9	2.9
4.00-3.50	2.3	5.2
3.50-3.00	2.2	7.5
3.00-2.50	5.7	13.2
2.50-2.00	5.6	18.8
2.00-1.50	7.5	26.3
1.50-1.00	19.9	46.2
1.00-0.50	37.2	83.4
0.50-0.00	16.6	100.0
D(AVE)		0.95 (PM)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot #2A-3  
Sample #1

HORIBA CAPA-500

PARTICLE ANALYZER

DATE 5-24-86  
SAMPLE NASA LOT #2A-3  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

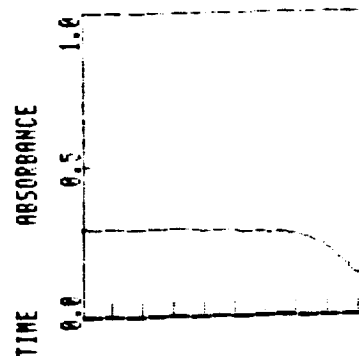
\* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01 (PM)  
D(DIV) 0.50 (PM)

SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

\* DATA



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NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

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3. Brookfield Viscosity.....	1
4. Gel Time.....	1
5. Atomic Absorption.....	1
6. Gas Chromatography.....	1
7. TGA.....	1
8. DSC.....	1
9. HPLC.....	1
10. GPC.....	1
11. pH.....	2
12. Phenol Content.....	2
13. Chang's Index.....	2
14. RDS.....	2
15. NMR.....	2

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TGA.....	7A - 7B
DSC.....	8A - 8B
HPLC.....	9A - 9B
GPC.....	10A - 10B
RDS.....	14A - 14B
NMR.....	15A - 15B



## RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

1. Resin Solids, % PTM-7C	#2-1	#2-2	
	78.8	78.7	
	78.7	79.3	
	<u>79.1</u>	<u>79.6</u>	
	AVG. 78.9	79.2	
	Lot# 2	AVERAGE	79.1
2. Specific Gravity @ 25°C PTM-29C	1.189	1.193	
	Lot# 2	AVERAGE	1.191
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C	17,400	16,800	
	Lot# 2	AVERAGE	17,100
4. Gel Time, min:sec PTM-47B	4:00	4:20	
	Lot# 2	AVERAGE	4:10
5. Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)	#2-1	#2-2	LOT2 AVG
	Na 25.0	20.8	22.9
	K 1.0	0.5	0.8
	Ca 7.5	7.0	7.3
	Mg 2.0	2.0	2.0
	Li 0.0	0.0	0.0
	AVG. 35.5	30.3	32.9
6. Volatiles, Gas Chromatography CTM-55	See Charts 6A-6B		
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	39.4	38.2	
	Lot# 2	AVERAGE	38.8
	See Chart 7A-7B		
8. DSC, temperature °C CTM-50A	190	189	
	Lot# 2	AVERAGE	190
	See Chart 8A-8B		
	See Chart 9A-9B		
9. HPLC CTM-49A			
10. GPC, Average molecular wt. CTM-49A	1800	1631	
	Lot# 2	AVERAGE	1716

See Chart 10A-10B



USP-39A Resin Lot for NASA Lot# 2

11. pH, units CTM-1B	<u>#2-1</u>	<u>#2-2</u>
	8.4	8.5
	Lot# 2	AVERAGE 8.5
12. Phenol Content, % CTM-55 Appendix 1	13.29	13.65
	<u>12.94</u>	<u>13.31</u>
	AVG. 13.12	13.48
	Lot# 2	AVERAGE 13.30
13. Chang's Index, ml. CTM-5B	23.6	23.8
	Lot# 2	AVERAGE 23.7
14. RDS, Minimum Viscosity, cps. CTM-57A	<u>Min. Visc.</u>	<u>°C</u>
	#2-1	172
	#2-2	124
	AVG.	148
		114
		114
	See Charts 14A-14B	
	See Charts 15A-15B	
15. NMR Vendor procedure		

U. S. Polymeric

*Hamid M. Quraishi*  
 Hamid M. Quraishi, Manager  
 Quality Assurance Department

# TYPICAL GAS CHROMATOGRAPH SET-UP

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Operator <u>J. J. J.</u>	Date <u>12/11/86</u>
Column <u>6ft.</u>	Detector <u>FID</u>
Length <u>1/4 in.</u>	Voltage <u>        </u>
Dia. <u>1/4 in.</u>	Sensit. <u>        </u>
Liquid Phase <u>AT-1000</u>	Flow Rates, ml/min
Wt. % <u>0.1</u>	Hydrogen <u>60</u> Air <u>96</u>
Support <u>GRAPHAC</u>	Scavenge <u>        </u>
Mesh <u>80/100</u>	Split <u>        </u>
Carrier Gas <u>He</u>	Temperature, °C
Rotameter <u>        </u>	Det. <u>220</u> Inj. <u>200</u>
Inlet Press. <u>60</u> psig	Column Initial <u>60</u>
Rate <u>30</u> ml/min	Final <u>210</u>
CHART SPEED <u>50</u>	Rate <u>50</u> MIN
SAMPLE <u>USP39A, 2F</u>	Solvent <u>THF</u>
Size <u>0.1 µl</u>	Concn. <u>0.11%</u> <u>gluc</u>

## GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

### STANDARD SOLVENT/MONOMER

### RETENTION TIME (MINS.)

MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

REAL TIME CHROMATOGRAM \*\*\*

VERTICAL SCALE FACTOR 1X

FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 2-1  
MISC: C=0.11190 GMS/ML

TIME: 12:59  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	6.3	7064	0.75	3	358
5	1.65	79730	1.953	2	11467
6	1.78	201690	4.940	2	11452
7	3.30	3335700	81.708	3	90562
8	5.00	6073	1.49	4	251
9	5.55	5751	1.41	4	417
10	6.30	4291	1.05	4	182
11	6.30	4282	1.05	4	172
12	6.30	1101	0.27	4	80
19	11.70	13778	3.37	3	767
25	16.20	1075	0.26	2	61
34	21.85	68060	1.667	2	10096
35	22.00	357860	8.766	2	14615

TOTAL AREA= 4082456  
THRESHOLD= 1  
MIN PE WIDTH= 15  
AREA REJECT= 1000

SAMPLE: USP39A 2-1  
MISC: C=0.11190 GMS/ML

TIME: 12:59  
DATE: 12/11/86  
OPERATOR: JGZ

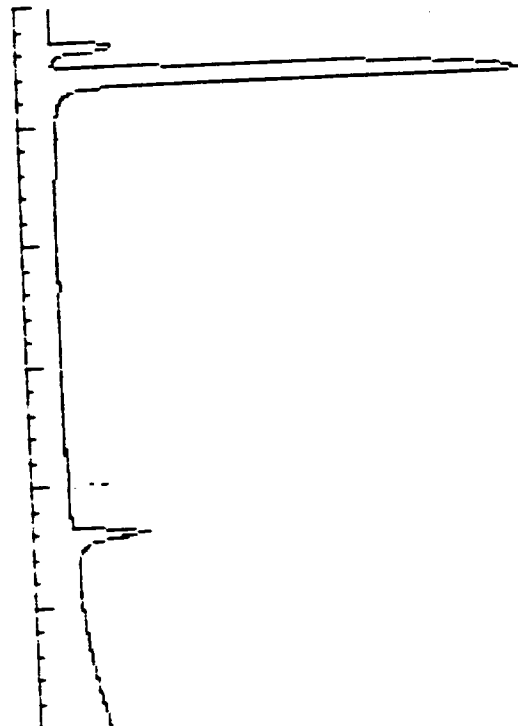
RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.65	79730	1.965	2	11467
6	1.78	201690	4.972	2	11452
7	3.30	3335700	82.225	3	90562
19	11.70	13778	3.40	3	767
34	21.85	68060	1.678	2	10096
35	22.00	357860	8.821	2	14615

TOTAL AREA= 4056818  
THRESHOLD= 1  
MIN PE WIDTH= 15  
AREA REJECT= 10000

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\*\*\* REAL TIME CHROMATOGRAM \*\*\*



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 2-2  
MISC: C=0.10080 GMS/ML

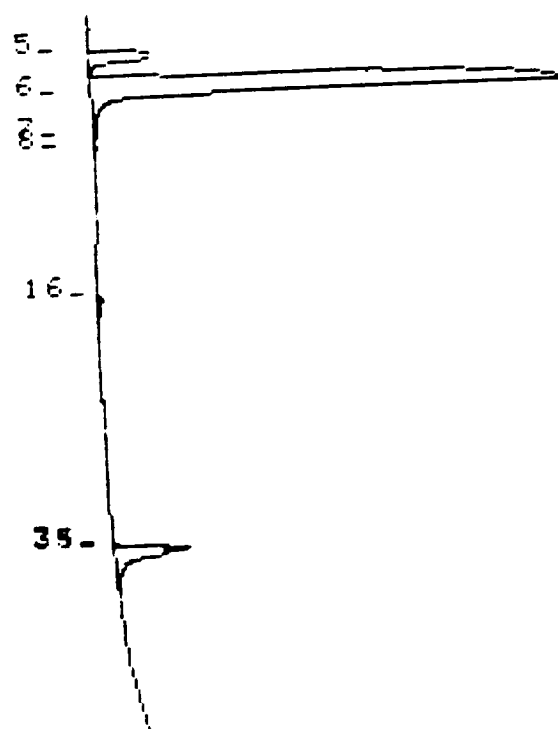
TIME: 14:47  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	1.63	2693	.061	3	360
5	1.68	298230	6.703	2	11370
6	3.38	3695300	83.049	3	89961
7	5.08	4838	.109	4	199
8	5.58	4532	.102	2	478
16	11.70	14184	.319	3	714
34	21.88	53228	1.196	2	10083
35	22.03	376520	8.462	3	14774

TOTAL AREA= 4449524  
THRESHOLD= 1  
MIN. PK. WIDTH= 15  
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 2-2  
MISC: C=0.10080 GMS/ML

TIME: 14:47  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.68	298230	6.742	2	11370
6	3.38	3695300	83.542	3	89961
34	21.88	53228	1.203	2	10083
35	22.03	376520	8.512	3	14774

TOTAL AREA= 4423276  
THRESHOLD= 1  
MIN. PK. WIDTH= 15  
AREA REJECT= 15000

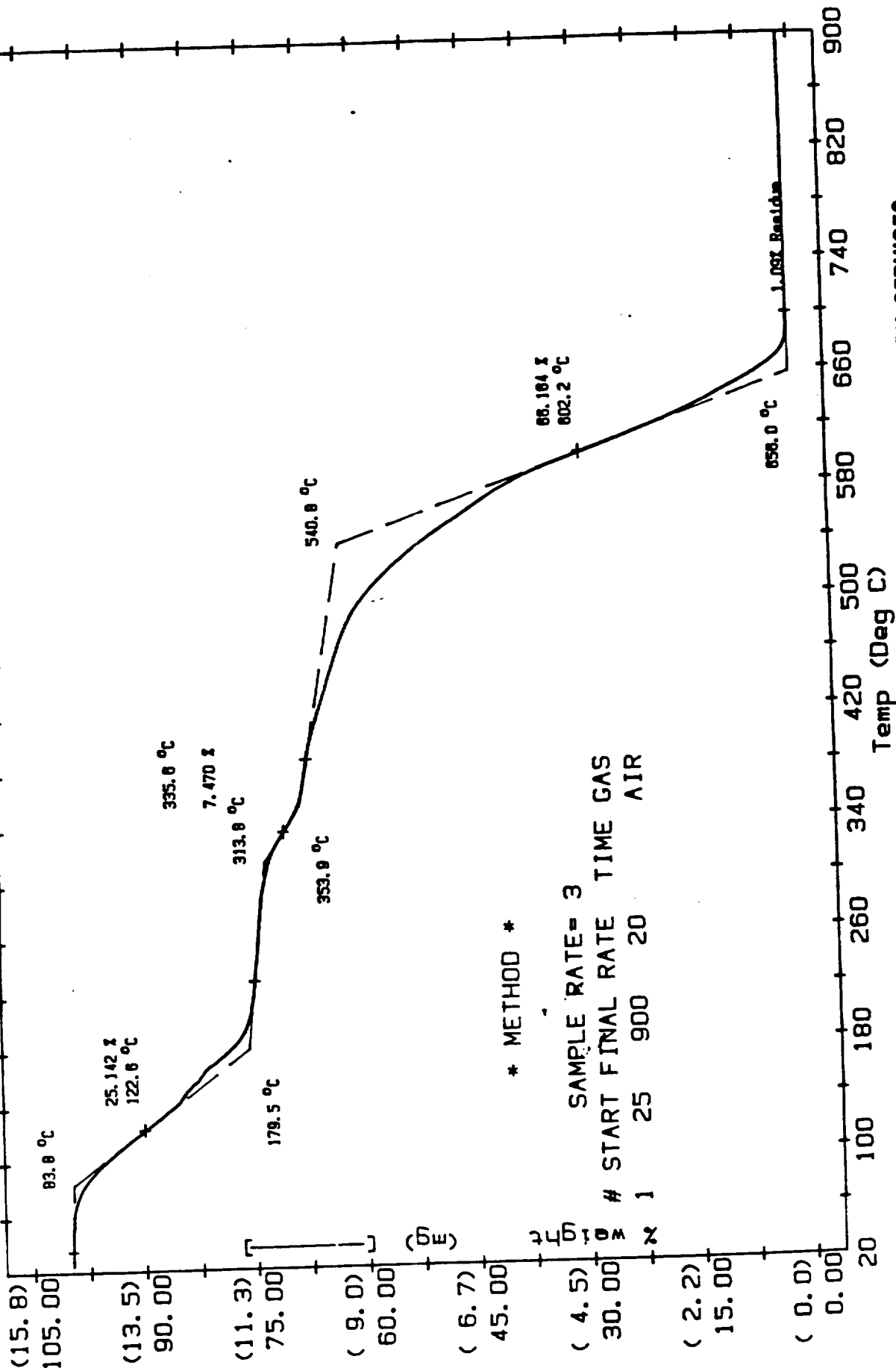
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Operator: M. WEGENER  
Disk ID: DATA DISK #107  
File No: D 34.DAT V2.1  
Plotted: MAY/22/86 07:50

# TGA

OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL

Sample: USP39A71108 2-1  
Size: 15.101 mg  
Run No: MIR #13079 (12)  
Date: MAY/21/86 10:28



\* METHOD \*

SAMPLE RATE= 3  
# START FINAL RATE TIME GAS  
1 25 900 20 AIR

ANALYTICAL LABORATORY SERVICES

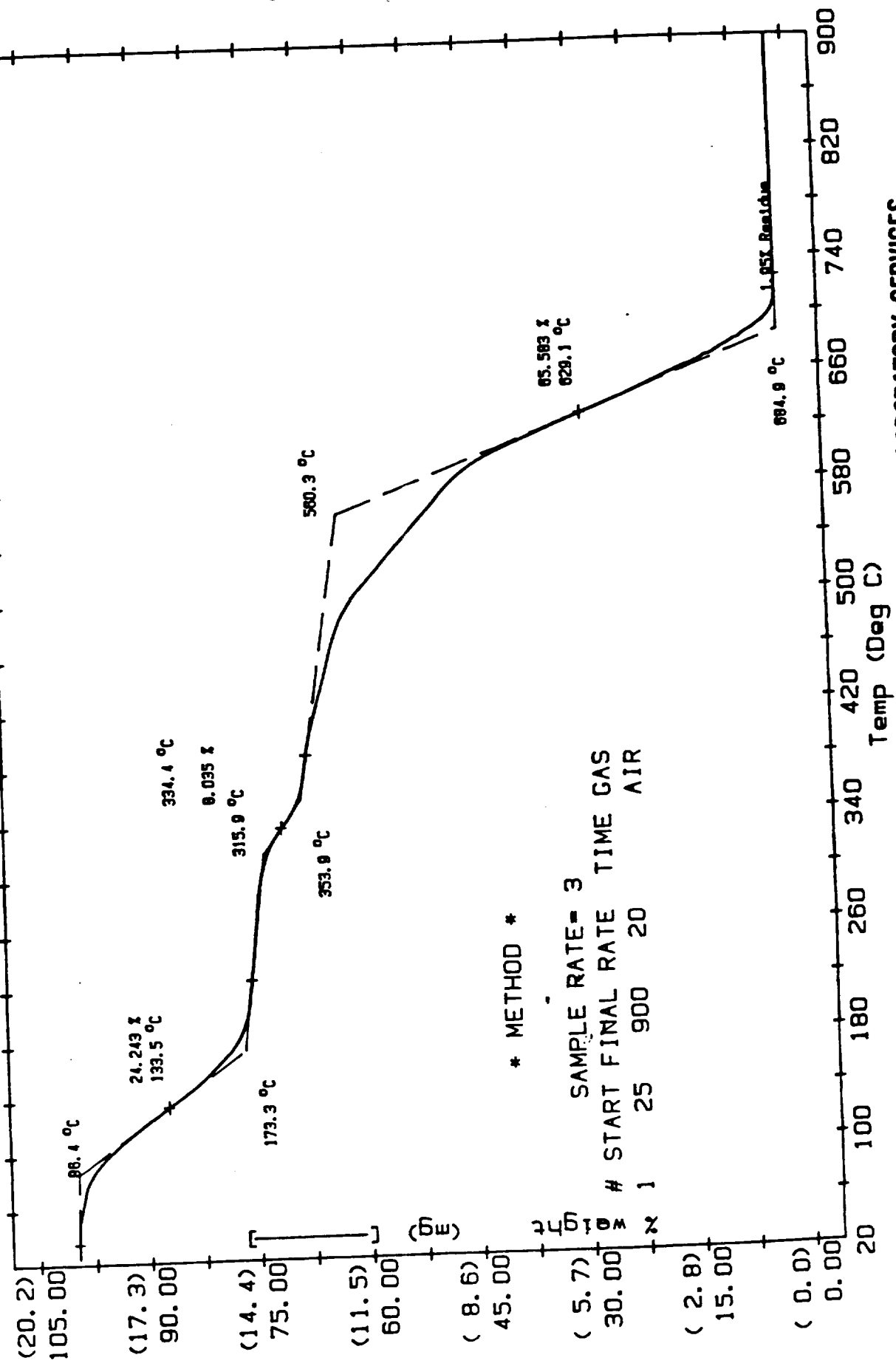
**Beckman Industrial™**

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Operator: M. WEGENER  
Disk ID: DATA DISK #107  
File No: D 35.DAT V2.1  
Plotted: MAY/22/86 07:58

TGA  
OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL

Sample: USP39A71108 2-2  
Size: 19.294 mg  
Run No: MIR #13079 (12)  
Date: MAY/21/86 11:43



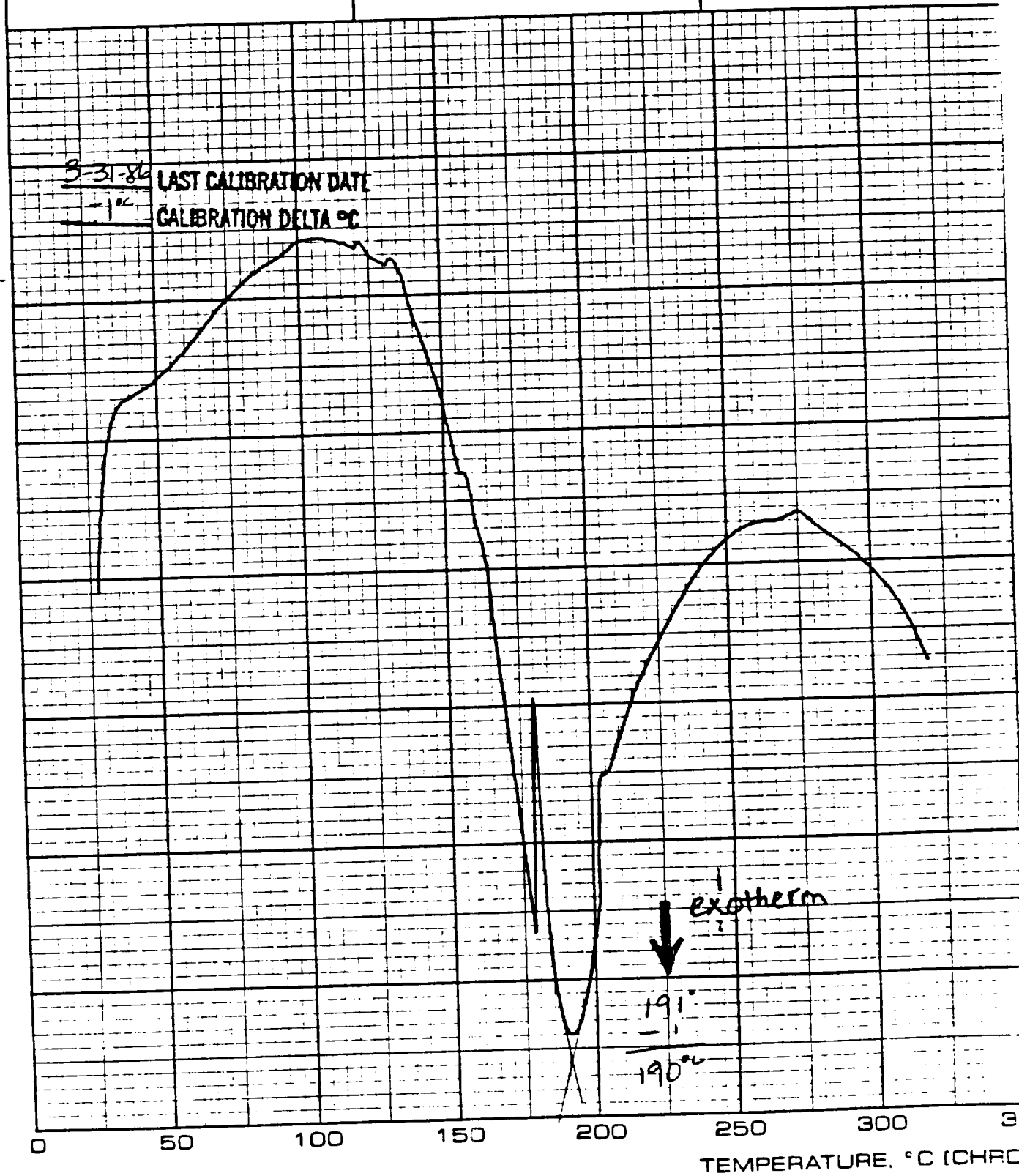
\* METHOD \*

SAMPLE RATE = 3  
# START FINAL RATE TIME GAS  
1 25 900 20 AIR

ANALYTICAL LABORATORY SERVICES

Beckman Industrial™

RUN NO. _____ DATE <u>4/3/86</u>	T-AXIS	DTA-DSC
OPERATOR <u>JP</u>	SCALE, °C/in. <u>50</u>	SCALE, °C/in. <u>1.0/5</u>
SAMPLE: <u>2-PP</u>	PROG. RATE, °C/min. <u>20</u>	(mcal/sec)/in. _____
ATM. <u>He</u> @ <u>1 atm.</u>	HEAT <u>/</u> COOL _____ ISO _____	WEIGHT, mg <u>4.5</u>
FLOW RATE <u>40 ml/min</u>	SHIFT, in. <u>0</u>	REFERENCE _____
	<u>- 1 °C</u>	<u>1 AL CUP PLUS SE.</u>



DUPONT Instruments

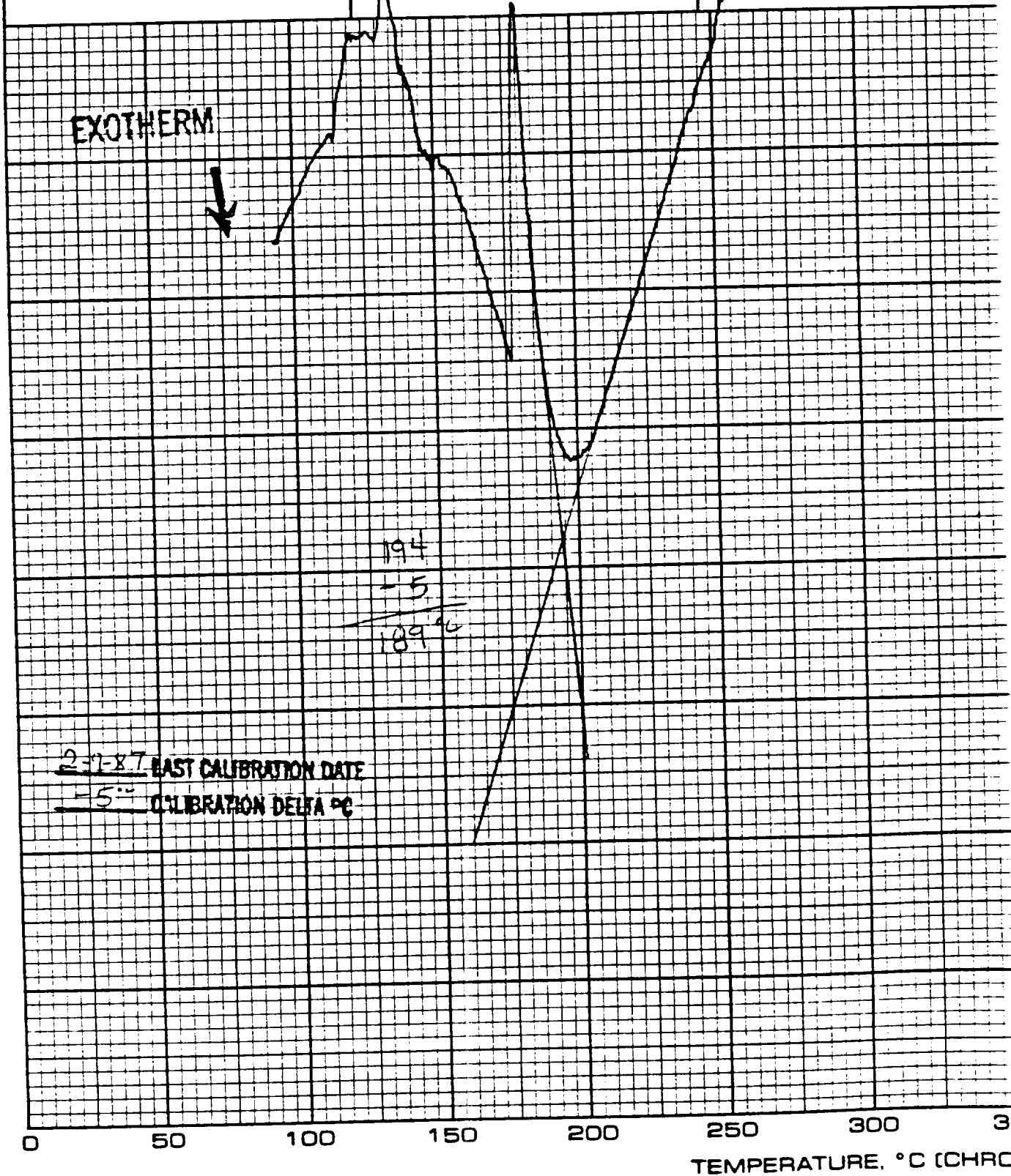
PART NO. 990088

CHART 3B

RUN NO. _____ DATE <u>2-23-87</u>		T-AXIS		DTA-DSC	
OPERATOR <u>all</u>		SCALE, °C/in. <u>50</u>		SCALE, °C/in. <u>1.0/5x</u>	
SAMPLE: <u>2-2</u>		PROG. RATE, °C/min <u>20°</u>		(mcal/sec)/in. _____	
<u>usp 39A</u>		HEAT <input checked="" type="checkbox"/> COOL _____ ISO _____		WEIGHT, mg <u>3.11</u>	
ATM. <u>N<sub>2</sub></u> @ <u>1 atm</u>		SHIFT, in. <u>0</u>		REFERENCE _____	
FLOW RATE <u>40 ml/min</u>				<u>1 alum seal</u>	

DUPONT Instruments

MEASURED VARIABLE \_\_\_\_\_





DATA FILE A:PHEND20.HDR TAKEN 09-01-1986 15:13:56

## \*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

\*\*\*\*\*  
 \* Sample Name: USP39A,2-1,C=5.555 Operator Initials: JGZ  
 \* Date: 09-01-1986 15:13:56 Method:PHENOLIC DATA FILE: A:PHEND20.PTS  
 \* Interface: 4 Cycle#: 20 Channel#: 0 Vial#: N.A.  
 \* Starting Peak Width: 10 Threshold: .01  
 \*\*\*\*\*  
 \* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18  
 \* Solvent Description: THF/WATER, 2:1 BY WEIGHT  
 \* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN  
 \* Detector 0: 220NM/.5AU Detector 1:  
 \* Misc. Information: LENGTH=25  
 \*\*\*\*\*  
 Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.73	2256	1.2208	1	562	2.392	4.0
2	1.82	94314	51.0355	2	5417	100.000	17.4
3	1.97	29598	16.0160	2	5094	31.382	5.8
4	2.07	58633	31.7278	2	5278	62.168	11.1

Total Area: 184801 Area Reject: 1000 One sample per 1.000 sec.

PHENOLIC  
 09-01-1986

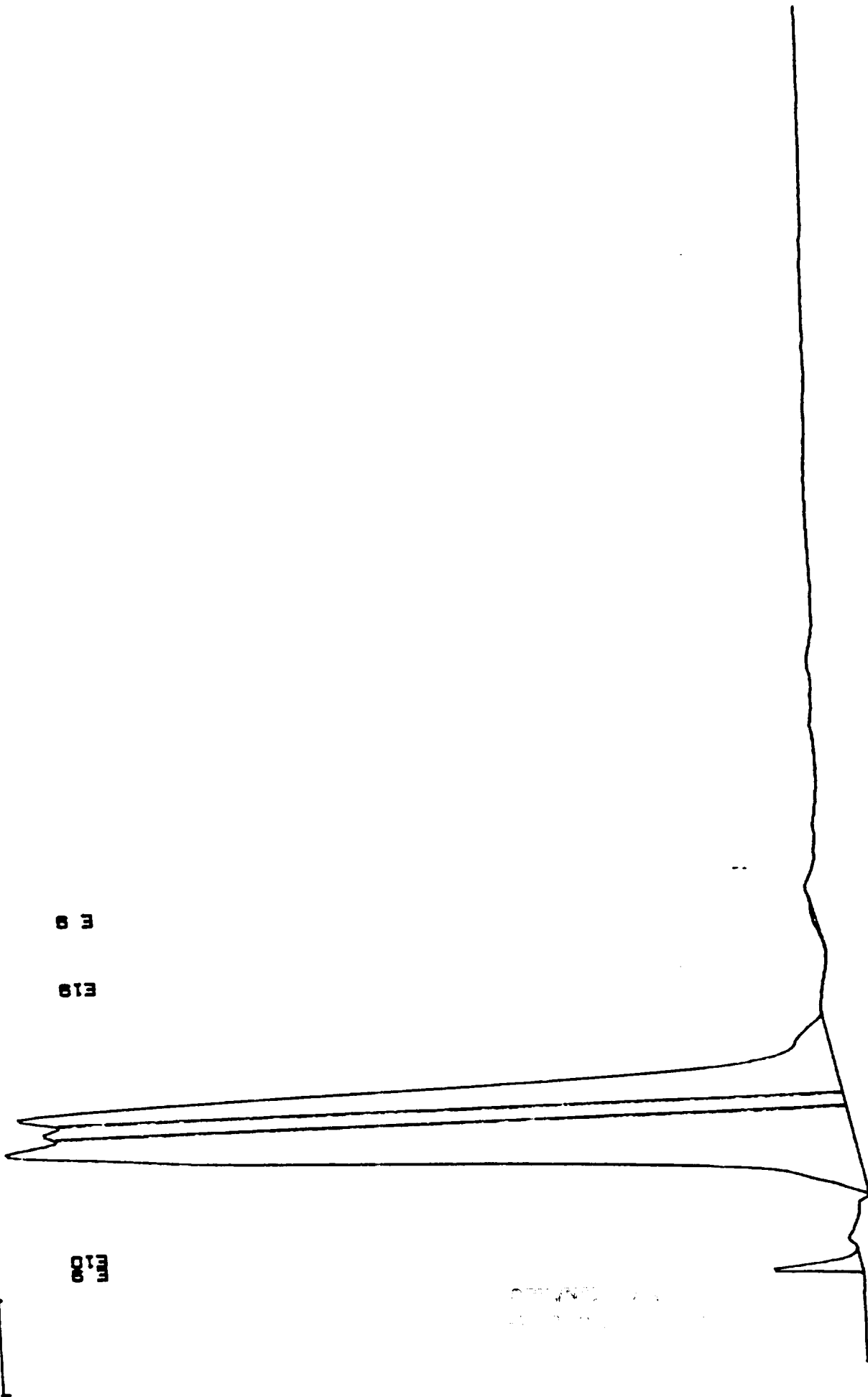
DATA FILE=PHEN020 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.001 MG. HIGH SCALE 10.00 MG  
USP-38A, 2-1. C-5.555 MG/ML, 8/2/86, JGZ

1.82  
2.07

0.73

0.13  
0.13

0.13  
0.13



DATA FILE A:PHEN027.HDR TAKEN 09-05-1986 11:31:38

\*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

\*\*\*\*\*  
 \* Sample Name: USP39A,2-2,C=6.99 Operator Initials: JGZ  
 \* Date: 09-05-1986 11:31:38 Method:PHENOLIC DATA FILE: A:PHEN027.FTS  
 \* Interface: 4 Cycle#: 27 Channel#: 0 Vial#: N.A.  
 \* Starting Peak Width: 10 Threshold: .01  
 \*\*\*\*\*  
 \* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18  
 \* Solvent Description: THF/WATER, 2:1 BY WEIGHT  
 \* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN  
 \* Detector 0: 220NM/.5AU Detector 1:  
 \* Misc. Information: LENGTH=25  
 \*\*\*\*\*  
 Starting Delay: 0.00 Ending Retention Time: 10.00

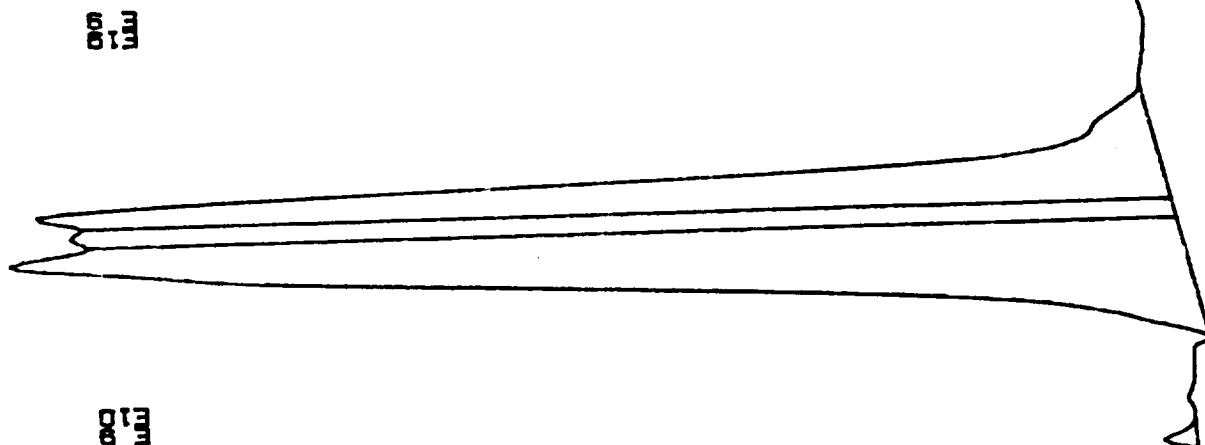
Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/Height
2	1.82	96860	53.0012	2	5305	100.000	18.3
3	1.97	28712	15.7109	2	4980	29.643	5.8
4	2.07	57179	31.2879	2	5119	59.032	11.2

Total Area: 182750 Area Reject: 1000 One sample per 1.000 sec.

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USP-3RA -2. C-6.88 MG/ML, 8/5/88, JGZ

1.88  
2.07  
2.12



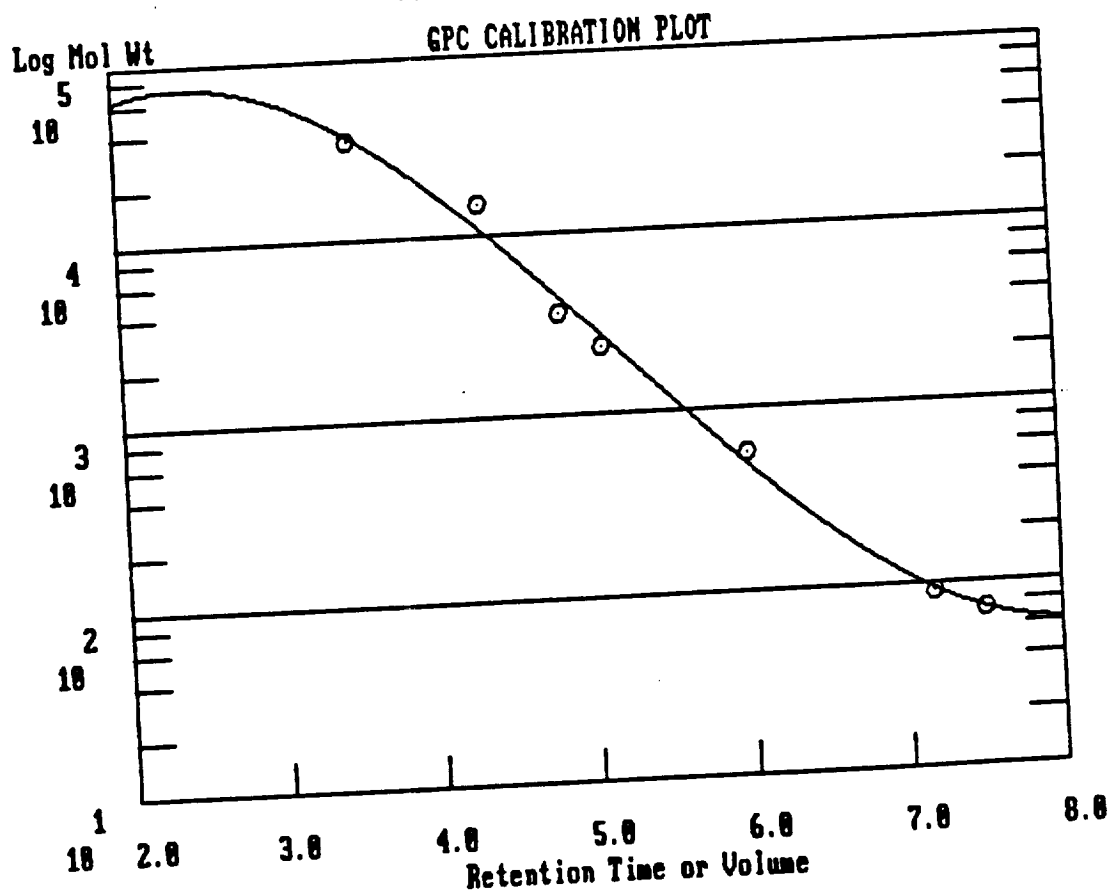
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# GPC CALIBRATION PLOT

\*\*\* Calibration Data \*\*\*  
 Calibration Name:  
 Misc Information:

Fit Type: 3  
 $\text{Log Mol Wt} = A + Bx + Cx^2 + Dx^3$   
 $A = 2.538977 \quad B = 2.115815 \quad C = -.5646824 \quad D = 3.606432E-02$   
 Coefficient of Determination: 0.9902  
 Ret Time                      Molecular Weight                      Log Mol Wt

3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



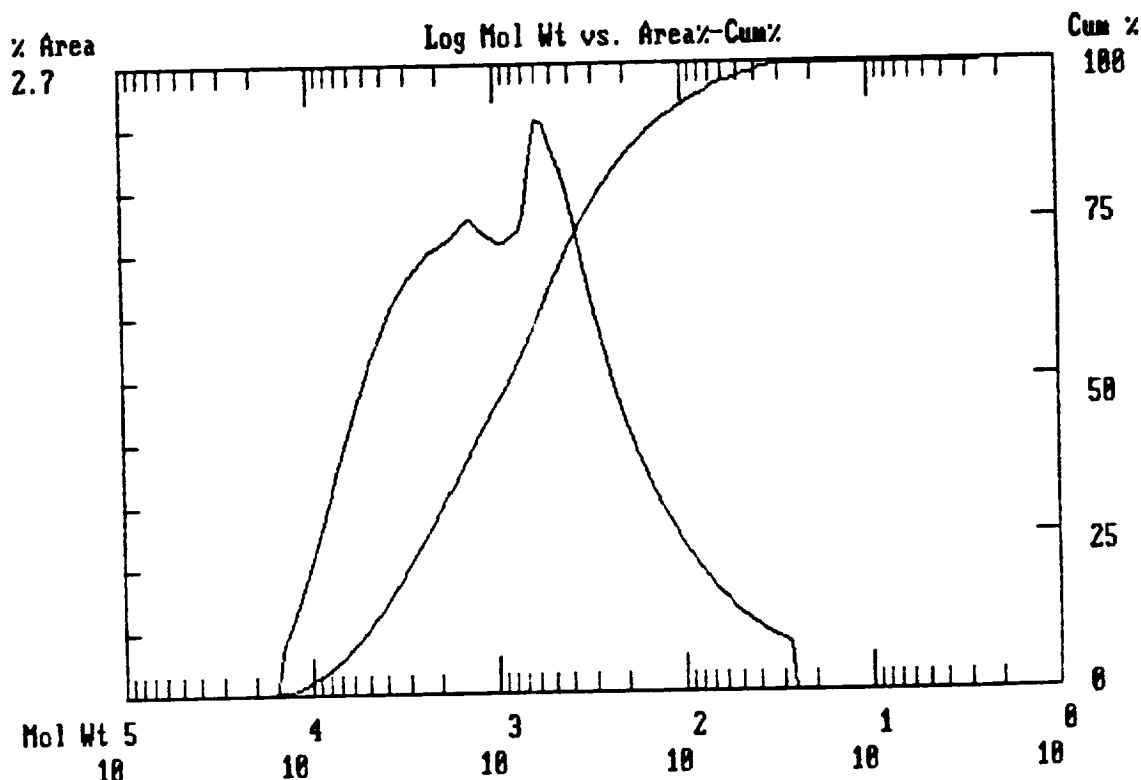
DATA FILE A:GPC33.HDR TAKEN 08-05-1986 17:47:28

## \*\*\*\*\* GPC REPORT \*\*\*\*\*

```

*****
* Sample Name: USP39A 2-1=2.68                      Operator Initials: GBF
* Date: 08-05-1986 15:48:25 Method:                  DATA FILE: A:GPC33.FTS
* Interface: 5                      Cycle#: 33         Channel#: 0   Vial#: N.A.
* Starting Peak Width: 60   Threshold: 0
*****
* Instrument Type: HPLC/BECKMAN                      Column Type: ULTRASTYRAGEL 500A
* Solvent Description: THF
* Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
* Detector 0: 254NM/.1AU                      Detector 1:
* Misc. Information: CALIBRATION/GPC
*****
Starting Delay: 0.00                      Ending Retention Time: 10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES: 3.85 to 10.00   MW: 22295 to 2
Process TIMES: 3.85 to 10.00   MW: 22295 to 2
Total Area: 243177
Mw= 1800
Mn= 334
W/Mn= 5.3756
Iz= 4852
Iv= 1551

```

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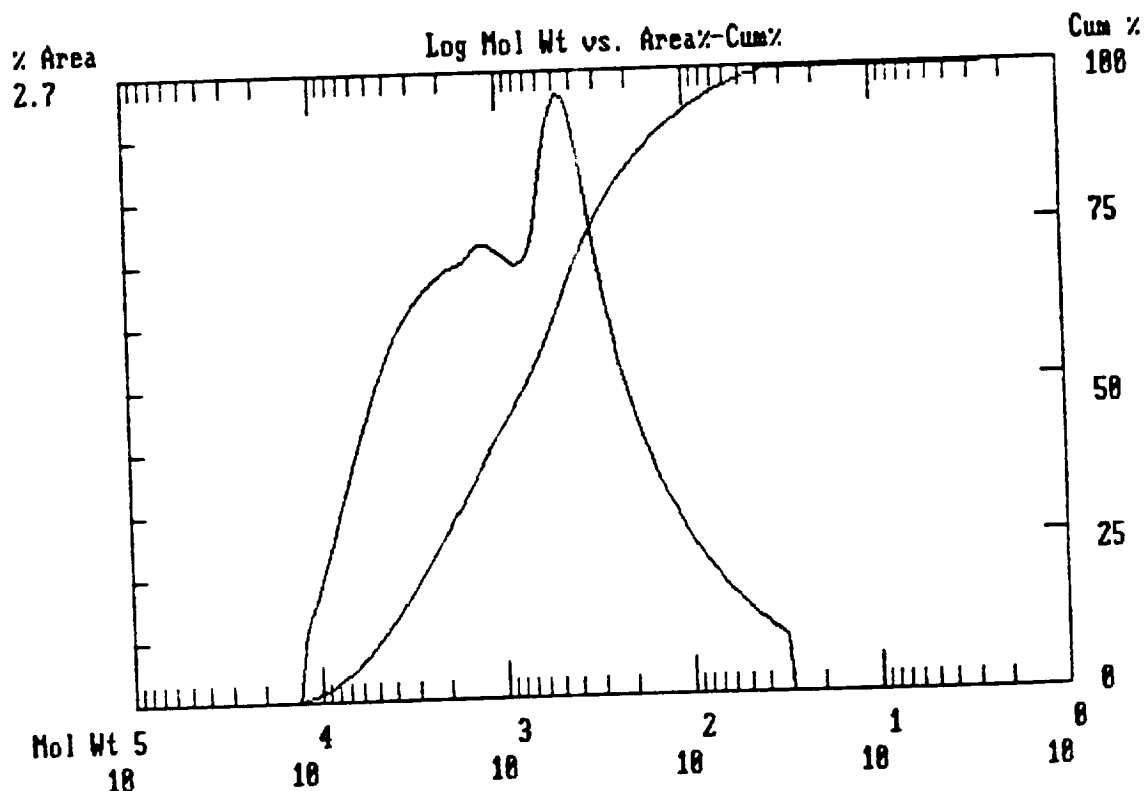
FILE A:GPC34.HDR TAKEN 08-05-1986 17:50:20

\*\*\*\*\* GPC REPORT \*\*\*\*\*

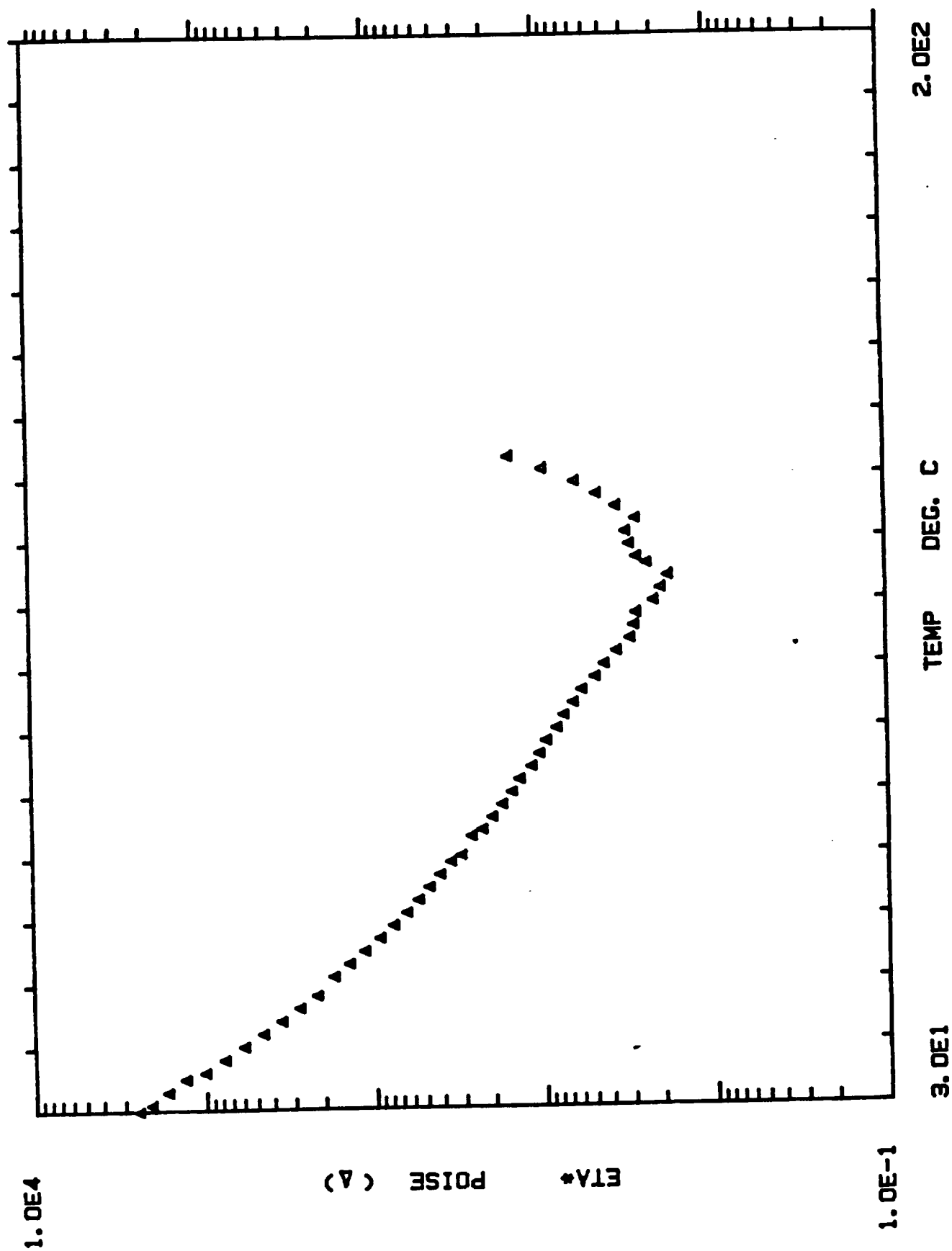
```

*****
Sample Name: USP39A 2-2=2.68      Operator Initials: GBF      *
Date: 08-05-1986 16:04:45 Method: DATA FILE: A:GPC34.PTS      *
Interface: 5      Cycle#: 34      Channel#: 0      Vial#: N.A.      *
Starting Peak Width: 60      Threshold: 0      *
*****
Instrument Type: HPLC/BECKMAN      Column Type: ULTRASTYRAGEL 500A      *
Solvent Description: THF      *
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN      *
Detector 0: 254NM/.1AU      Detector 1:      *
Misc. Information: CALIBRATION/GPC      *
*****
Starting Delay: 0.00      Ending Retention Time: 10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES: 3.85 to 10.00 MW: 22295 to 2
Process TIMES: 3.85 to 10.00 MW: 22295 to 2
Total Area: 198243
Mw= 1631
Mr= 328
Mw/Mn= 4.9600
Mn= 4349
Mz= 1407

```



NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2--1





Rheometrics RECAP II

---

Experiment No. : 2      Sample No. : 1

Title:  
AS FINGERPRINT VISCOSITY PROFILE USP 39A PESIN NASA LOT2-1

Operator : CP

Date and Time : Friday, August 15, 1986 - 12:30:37

Operating Mode : DYNAMIC

Heep Type : CURE

Geometry : DISK & PLATE  
RADIUS : 25.00  
GAP : 0.50

Notes :  
TRAIN =50%  
FREQUENCY =10 RAD/SEC

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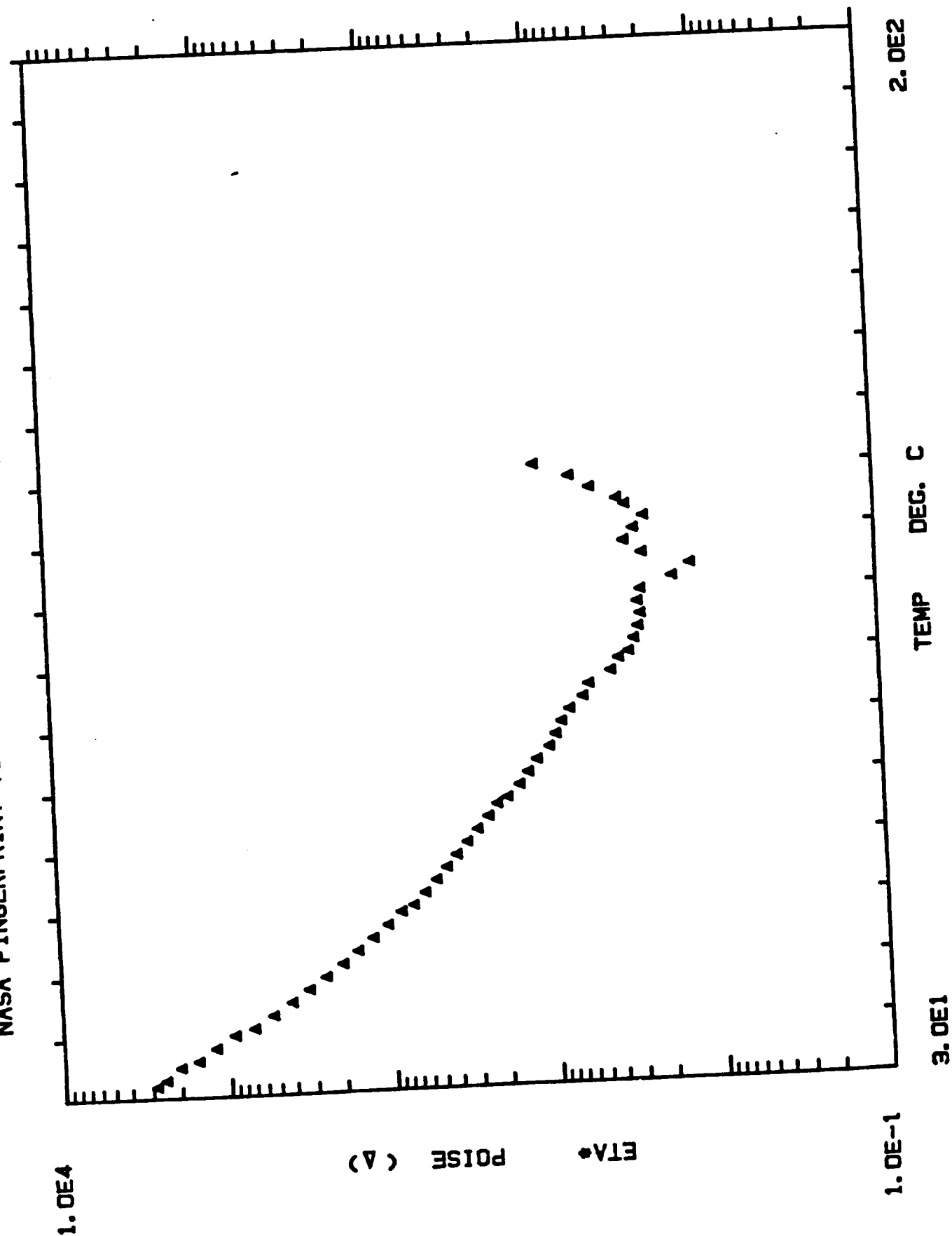
ID.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.429e+003	2.485e+003	4.847e+001	3.172e+002	2.000e+001	2.800e+001
2	2.642e+003	2.641e+003	4.982e+001	3.370e+002	1.000e+000	2.900e+001
3	2.428e+003	2.428e+003	3.159e+001	3.095e+002	2.000e+000	3.000e+001
4	2.051e+003	2.051e+003	3.626e+001	2.807e+002	3.000e+000	3.100e+001
5	1.636e+003	1.636e+003	3.612e+001	2.076e+002	4.000e+000	3.300e+001
6	1.283e+003	1.292e+003	3.520e+001	1.625e+002	5.000e+000	3.500e+001
7	9.557e+002	9.849e+002	3.027e+001	1.245e+002	6.000e+000	3.600e+001
8	7.555e+002	7.550e+002	2.754e+001	9.537e+001	7.000e+000	3.800e+001
9	5.786e+002	5.780e+002	2.598e+001	7.296e+001	8.000e+000	4.000e+001
10	4.473e+002	4.473e+002	2.357e+001	5.638e+001	9.000e+000	4.200e+001
11	3.477e+002	3.469e+002	2.768e+001	4.378e+001	1.000e+001	4.400e+001
12	2.715e+002	2.706e+002	2.171e+001	3.414e+001	1.100e+001	4.600e+001
13	2.136e+002	2.126e+002	2.044e+001	2.686e+001	1.200e+001	4.800e+001
14	1.693e+002	1.680e+002	2.056e+001	2.126e+001	1.300e+001	5.100e+001
15	1.371e+002	1.356e+002	2.031e+001	1.723e+001	1.400e+001	5.300e+001
16	1.110e+002	1.094e+002	1.889e+001	1.794e+001	1.500e+001	5.500e+001
17	9.041e+001	8.878e+001	1.708e+001	1.135e+001	1.600e+001	5.700e+001
18	7.490e+001	7.343e+001	1.478e+001	9.399e+000	1.700e+001	5.900e+001
19	6.248e+001	6.116e+001	1.280e+001	7.843e+000	1.800e+001	6.100e+001
20	5.332e+001	5.221e+001	1.105e+001	6.692e+000	1.900e+001	6.300e+001
21	4.604e+001	4.506e+001	9.437e+000	5.777e+000	2.000e+001	6.500e+001
22	3.975e+001	3.897e+001	7.829e+000	4.935e+000	2.100e+001	6.700e+001
23	3.415e+001	3.357e+001	6.480e+000	4.291e+000	2.200e+001	6.900e+001
24	2.971e+001	2.916e+001	5.717e+000	3.731e+000	2.300e+001	7.000e+001
25	2.574e+001	2.523e+001	5.128e+000	3.339e+000	2.400e+001	7.300e+001
26	2.270e+001	2.191e+001	4.110e+000	2.800e+000	2.500e+001	7.400e+001
27	1.940e+001	1.907e+001	3.540e+000	2.434e+000	2.600e+001	7.600e+001
28	1.690e+001	1.657e+001	3.296e+000	2.121e+000	2.700e+001	7.800e+001
29	1.480e+001	1.457e+001	2.316e+000	1.857e+000	2.800e+001	8.000e+001
30	1.328e+001	1.299e+001	2.741e+000	1.667e+000	2.900e+001	8.200e+001
31	1.125e+001	1.105e+001	2.093e+000	1.411e+000	3.000e+001	8.400e+001
32	1.007e+001	9.917e+000	1.751e+000	1.264e+000	3.100e+001	8.600e+001
33	9.165e+000	9.050e+000	1.573e+000	1.151e+000	3.200e+001	8.800e+001
34	7.912e+000	7.827e+000	1.152e+000	9.930e+000	3.300e+001	9.000e+001
35	7.192e+000	7.145e+000	8.155e+000	9.030e+000	3.400e+001	9.200e+001
36	6.315e+000	6.283e+000	6.316e+000	7.925e+000	3.500e+001	9.400e+001
37	5.609e+000	5.600e+000	3.301e+000	7.044e+000	3.600e+001	9.600e+001
38	4.670e+000	4.658e+000	3.331e+000	5.960e+000	3.700e+001	9.800e+001
39	4.120e+000	4.120e+000	0.000e+000	5.175e+000	3.800e+001	1.000e+002
40	3.470e+000	3.470e+000	4.507e+002	4.352e+000	3.900e+001	1.020e+002
41	3.387e+000	2.839e+000	0.000e+000	3.627e+000	4.000e+001	1.040e+002
42	2.743e+000	2.724e+000	3.160e+000	3.445e+000	4.100e+001	1.060e+002
43	2.657e+000	2.581e+000	6.310e+000	3.355e+000	4.200e+001	1.080e+002
44	2.102e+000	2.053e+000	4.494e+000	2.642e+000	4.300e+001	1.100e+002
45	1.906e+000	1.852e+000	4.519e+000	2.394e+000	4.400e+001	1.120e+002
46	1.720e+000	1.672e+000	4.072e+000	2.162e+000	4.500e+001	1.140e+002
47	2.296e+000	2.202e+000	6.523e+000	2.894e+000	4.600e+001	1.160e+002
48	2.627e+000	2.569e+000	5.507e+000	3.301e+000	4.700e+001	1.170e+002
49	2.883e+000	2.787e+000	7.547e+000	3.621e+000	4.800e+001	1.190e+002
50	3.024e+000	2.803e+000	1.135e+000	3.799e+000	4.900e+001	1.210e+002

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NO.	ETA*	ETA'	ETA''	TORQUE	TIME	TEMP
	POISE	POISE	POISE	GRAMS-CM	MIN.	DEG. C
51	2.642e+000	2.503e+000	8.451e-001	3.320e-001	5.000e+001	1.230e+002
52	3.438e+000	3.279e+000	1.035e+000	4.316e-001	5.100e+001	1.250e+002
53	4.448e+000	4.263e+000	1.269e+000	5.523e-001	5.200e+001	1.270e+002
54	5.984e+000	5.761e+000	1.618e+000	7.514e-001	5.300e+001	1.290e+002
55	9.317e+000	8.988e+000	2.454e+000	1.171e+000	5.400e+001	1.310e+002
56	1.470e+001	1.401e+001	4.424e+000	1.845e+000	5.500e+001	1.330e+002

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NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT2--2



Rheometrics RECAP II

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Experiment No. : 3 Sample No. : 1

Sample:  
ASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

Operator : CF

Date and Time : Friday, August 15, 1986 - 13:50:53

Operating Mode : DYNAMIC

Wave Type : CURE

Geometry : DISK & PLATE  
RADIUS : 25.00  
GAP : 0.50

Strain :  
STRAIN = 50%  
FREQUENCY = 10 RAD/SEC

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OF POOR QUALITY

N .	ETA+ POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.748e+003	2.747e+003	4.963e+001	3.500e+002	2.000e+001	3.200e+001
2	2.751e+003	2.750e+003	5.589e+001	3.503e+002	1.000e+000	3.200e+001
3	2.407e+003	2.407e+003	4.550e+001	3.062e+002	2.000e+000	3.300e+001
4	1.952e+003	1.952e+003	4.134e+001	2.476e+002	3.000e+000	3.500e+001
5	1.521e+003	1.520e+003	3.489e+001	1.925e+002	4.000e+000	3.600e+001
6	1.181e+003	1.180e+003	3.659e+001	1.493e+002	5.000e+000	3.800e+001
7	9.014e+002	9.010e+002	2.717e+001	1.137e+002	6.000e+000	4.000e+001
8	6.851e+002	6.845e+002	2.800e+001	8.640e+001	7.000e+000	4.100e+001
9	5.225e+002	5.219e+002	2.522e+001	6.579e+001	8.000e+000	4.300e+001
10	4.013e+002	4.007e+002	2.174e+001	5.052e+001	9.000e+000	4.500e+001
11	3.136e+002	3.129e+002	2.112e+001	3.947e+001	1.000e+001	4.700e+001
12	2.457e+002	2.449e+002	2.013e+001	3.090e+001	1.100e+001	4.900e+001
13	1.938e+002	1.928e+002	1.994e+001	2.436e+001	1.200e+001	5.100e+001
14	1.561e+002	1.549e+002	1.938e+001	1.961e+001	1.300e+001	5.300e+001
15	1.257e+002	1.244e+002	1.839e+001	1.580e+001	1.400e+001	5.500e+001
16	1.014e+002	1.003e+002	1.543e+001	1.273e+001	1.500e+001	5.700e+001
17	8.340e+001	8.234e+001	1.320e+001	1.047e+001	1.600e+001	5.900e+001
18	7.033e+001	6.940e+001	1.145e+001	8.840e+000	1.700e+001	6.000e+001
19	5.969e+001	5.884e+001	1.001e+001	7.496e+000	1.800e+001	6.200e+001
20	5.047e+001	4.972e+001	8.644e+000	6.340e+000	1.900e+001	6.400e+001
21	4.340e+001	4.276e+001	7.440e+000	5.447e+000	2.000e+001	6.600e+001
22	3.759e+001	3.701e+001	6.560e+000	4.720e+000	2.100e+001	6.800e+001
23	3.215e+001	3.168e+001	5.477e+000	4.034e+000	2.200e+001	7.000e+001
24	2.777e+001	2.736e+001	4.723e+000	3.486e+000	2.300e+001	7.200e+001
25	2.370e+001	2.333e+001	4.172e+000	2.977e+000	2.400e+001	7.400e+001
26	2.079e+001	2.049e+001	3.492e+000	2.609e+000	2.500e+001	7.600e+001
27	1.794e+001	1.770e+001	2.929e+000	2.253e+000	2.600e+001	7.700e+001
28	1.506e+001	1.483e+001	2.647e+000	1.890e+000	2.700e+001	7.900e+001
29	1.327e+001	1.309e+001	2.197e+000	1.666e+000	2.800e+001	8.100e+001
30	1.166e+001	1.154e+001	1.650e+000	1.463e+000	2.900e+001	8.300e+001
31	9.733e+000	9.579e+000	1.748e+000	1.222e+000	3.000e+001	8.500e+001
32	8.840e+000	8.742e+000	1.311e+000	1.110e+000	3.100e+001	8.700e+001
33	8.088e+000	7.995e+000	1.222e+000	1.015e+000	3.200e+001	8.900e+001
34	7.169e+000	7.105e+000	9.554e-001	9.000e-001	3.300e+001	9.100e+001
35	5.902e+000	5.868e+000	6.306e-001	7.406e-001	3.400e+001	9.300e+001
36	5.403e+000	5.353e+000	7.366e-001	6.783e-001	3.500e+001	9.500e+001
37	3.945e+000	3.945e+000	3.298e-002	4.951e-001	3.600e+001	9.700e+001
38	3.514e+000	3.503e+000	2.691e-001	4.410e-001	3.700e+001	9.900e+001
39	3.057e+000	3.055e+000	1.028e-001	3.835e-001	3.800e+001	1.000e+002
40	2.824e+000	2.824e+000	5.250e-002	3.546e-001	3.900e+001	1.020e+002
41	2.639e+000	2.638e+000	5.008e-002	3.310e-001	4.000e+001	1.040e+002
42	2.532e+000	2.532e+000	0.000e+000	3.180e-001	4.100e+001	1.060e+002
43	2.625e+000	2.619e+000	1.781e-001	3.298e-001	4.200e+001	1.080e+002
44	2.504e+000	2.427e+000	6.148e-001	3.143e-001	4.300e+001	1.100e+002
45	1.607e+000	1.519e+000	5.247e-001	2.019e-001	4.400e+001	1.120e+002
46	1.244e+000	1.234e+000	1.583e-001	1.560e-001	4.500e+001	1.140e+002
47	2.421e+000	2.362e+000	5.321e-001	3.040e-001	4.600e+001	1.160e+002
48	3.077e+000	2.937e+000	9.815e-001	3.888e-001	4.700e+001	1.180e+002
49	2.654e+000	2.593e+000	6.906e-001	3.370e-001	4.800e+001	1.200e+002
50	2.321e+000	2.208e+000	7.159e-001	2.914e-001	4.900e+001	1.220e+002

NO.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.992e+000	2.793e+000	1.074e+000	3.755e-001	5.000e+001	1.240e+002
52	3.334e+000	3.139e+000	1.123e+000	4.188e-001	5.100e+001	1.250e+002
53	4.323e+000	4.690e+000	1.125e+000	6.053e-001	5.200e+001	1.270e+002
54	6.376e+000	6.167e+000	1.617e+000	8.006e-001	5.300e+001	1.290e+002
55	1.043e+001	9.972e+000	3.074e+000	1.309e+000	5.400e+001	1.310e+002

ORIGINAL PAGE IS  
OF POOR QUALITY

SOLVENT ONLY  
SCAN

ORIGINAL PAGE IS  
OF POOR QUALITY

REMARKS:

SAMPLE: Solvent  
SOLVENT: Unid-d + 0.627%  
DEC. LEVEL: \_\_\_\_\_

AUTO ☐  
(250)  
(500)  
( 2 )  
( .05 )

MANUAL

SWEEP TIME (SEC): 30 250 500 1000  
SWEEP WIDTH (Hz): 25 50 100 250 500  
FILTER: 1 2 3 4 5 6 7 8  
RF POWER LEVEL: 0.10

SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 1.0  
INTEGRAL AMPLITUDE: ---  
SPINNING RATE (RPS): 30

SPECTRUM NO. 1A of 7

OPERATOR D & W

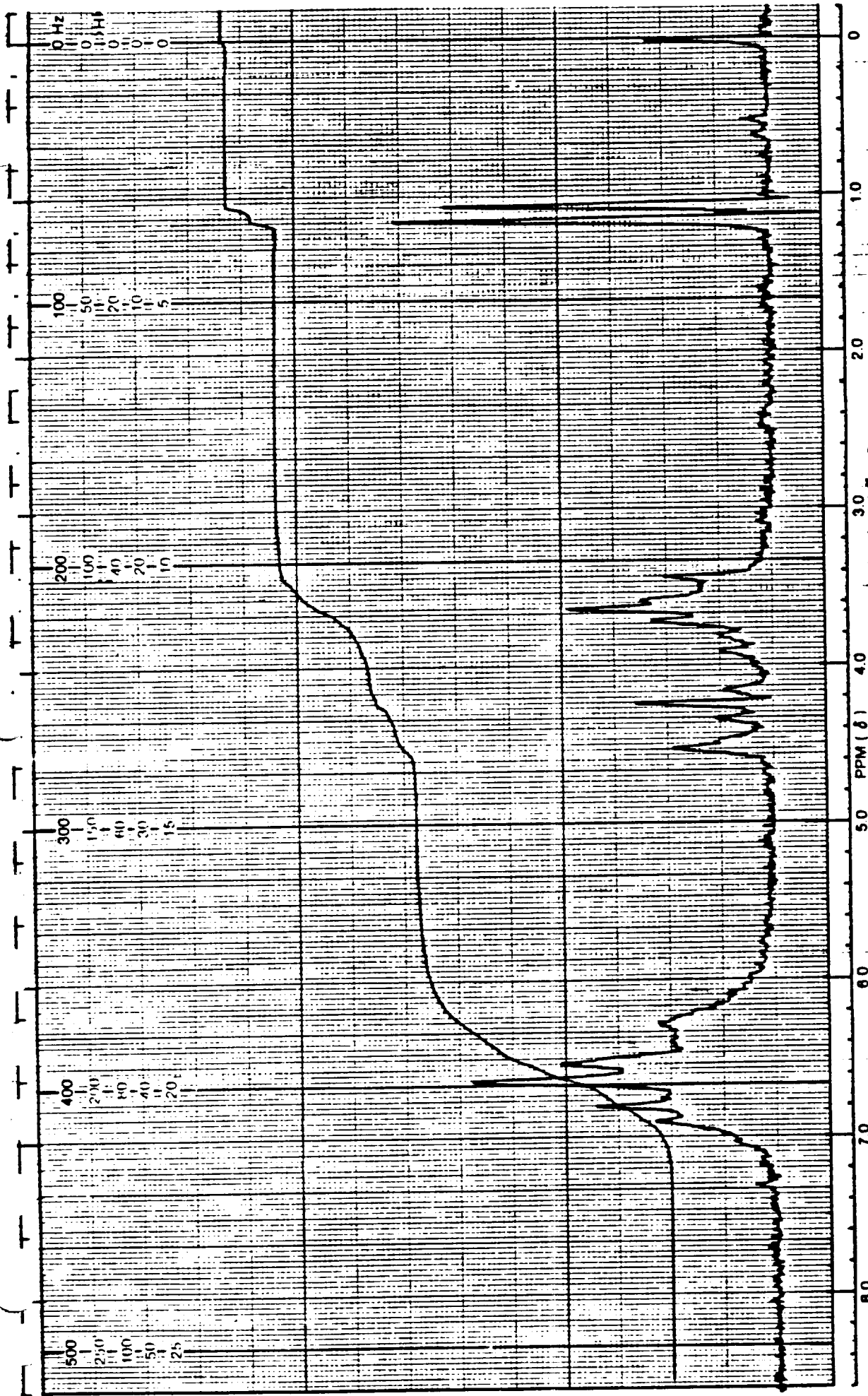
DATE: 3-21-86

NORELL, INC.  
LANDISVILLE, N.J. 08326  
Phone: (609) 697-0020

T-60

solvent only



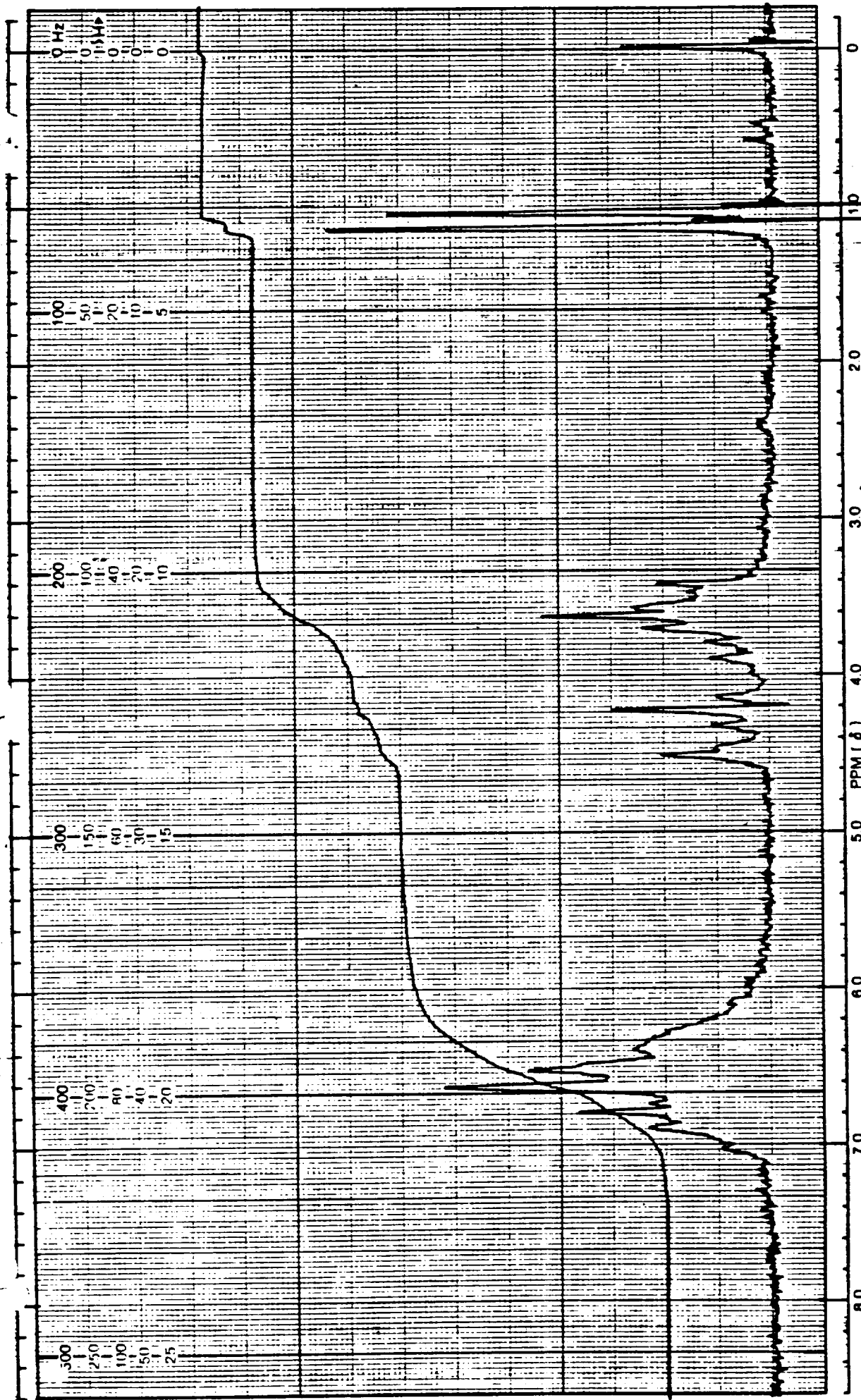


SWEEP OFFSET (Hz): 0  
 SPECTRUM AMPLITUDE: 8.0  
 INTEGRAL AMPLITUDE: 5.0  
 SPINNING RATE (RPS): 30

MANUAL ☒ AUTO ☐  
 SWEEP TIME (SEC): 30 25 20 15 10 5  
 SWEEP WIDTH (Hz): 25 30 40 50 60 70 80  
 FILTER: 1 2 3 4 5 6 7 8  
 RF POWER LEVEL: 0.25

SAMPLE: USP-39A H<sub>2</sub>O  
 SOLVENT: United-d + 0.5% TMS  
 DEC. LEVEL:

REMARKS: 0.130 gm sample  
 0.888 gm solvent



SWEEP OFFSET (Hz): 0  
 SPECTRUM AMPLITUDE: 1.0  
 INTEGRAL AMPLITUDE: 5.0  
 SPINNING RATE (RPS): 30

MANUAL ☒ AUTO ☐  
 SWEEP TIME (SEC): 30  
 SWEEP WIDTH (Hz): 73.50  
 FILTER: 1233333333  
 RF POWER LEVEL: 0.25

SAMPLE: USP-37A Lot# 2-2  
 SOLVENT: Chloro-d + 0.5% TMS  
 DEC. LEVEL:

REMARKS: 0.162 gm sample  
 1.072 gm solvent

OPERATOR: D6W  
 SPECTRUM NO: 4 of 7 USP-37A  
 Lot# 2-2

DATE: 3-21-86

ORIGINAL PAGE IS  
 OF POOR QUALITY

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U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 2 (KAISER)

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CHARTS

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TGA.....	6A - 6D



## FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 2 (KAISER)1a. Breaking Strength, lbs/in, WARP  
ASTM D1682

	<u>#2-2S</u>	<u>#2-2E</u>	<u>#2-3S</u>	<u>#2-3E</u>	<u>LOT2 AVG</u>
PICK	55	60	37	40	48.0
CENTER	47	75	46	54	55.5
PLAIN	<u>51</u>	<u>48</u>	<u>54</u>	<u>63</u>	<u>54.0</u>
AVG.	51.0	61.0	45.7	52.3	52.5

1b. Breaking Strength, lbs/inch, FILL  
ASTMD 1682

PICK	21	26	24	13	21.0
CENTER	21	20	19	17	19.3
PLAIN	<u>29</u>	<u>23</u>	<u>28</u>	<u>28</u>	<u>27.0</u>
AVG.	23.7	23.0	23.7	19.3	22.4

2a. Carbon Assay, %  
MDQAI 5560

PICK	99.7	99.6	99.3	99.4	99.50
CENTER	99.8	99.8	99.9	99.8	99.83
PLAIN	<u>99.7</u>	<u>99.4</u>	<u>99.5</u>	<u>99.5</u>	<u>99.53</u>
AVG.	99.73	99.6	99.57	99.57	99.62

2b. Hydrogen Assay, %  
MDQAI 5560

PICK	.02	<.01	<.01	.01	EST .008
CENTER	.01	<.01	<.01	<.01	EST .003
PLAIN	<u>.01</u>	<u>.02</u>	<u>&lt;.01</u>	<u>.01</u>	<u>EST .010</u>
AVG.	.013	EST .007	EST .001	EST .007	EST .007

2c. Nitrogen Assay, %  
MDQAI 5560

PICK	.1	.2	.02	<.05	EST .083
CENTER	.1	.2	.01	.1	.103
PLAIN	<u>.1</u>	<u>&lt;.05</u>	<u>.10</u>	<u>&lt;.05</u>	<u>EST .055</u>
AVG.	.1	EST .137	.043	EST .04	EST .080

3. Visual Inspection  
QC1-102

See Charts 3A-3B

WCA Fabric for NASA Lot# 2 (KAISER)4. Specific Gravity, Units  
PTM-84

	<u>#2-2S</u>	<u>#2-2E</u>	<u>#2-3S</u>	<u>#2-3E</u>	<u>LOT2 AVG</u>
	1.6315	1.5957	1.6378	1.6072	1.6181
	1.6659	1.6695	1.6194	1.6220	1.6442
	<u>1.6139</u>	<u>1.6559</u>	<u>1.6435</u>	<u>1.5999</u>	<u>1.6283</u>
AVG.	1.637	1.640	1.634	1.610	1.630

5. pH, Units  
CTM-24B

	6.3	6.5	6.4	6.4	6.40
	<u>6.4</u>	<u>6.5</u>	<u>6.4</u>	<u>6.3</u>	<u>6.40</u>
AVG.	6.35	6.5	6.4	6.35	6.40

6. TGA, °C at 50% Weight Loss  
CTM-51 (AIR)

	<u>SET UP# 1</u>	<u>SET UP# 2</u>
2-2S	944	2-2E 876
2-3S	950	2-3E 876
AVG.	947	AVG. 876

See Charts 6A-6D

7a. Atomic Absorption, ppm  
CTM-53B

	<u>#2-2S</u>	<u>#2-2E</u>	<u>#2-3S</u>	<u>#2-3E</u>	<u>LOT2 AVG</u>
Na	5	12	11	15	10.8
K	1	0	0	1	0.5
Ca	7	8	7	7	7.3
Mg	1	1	0	0	0.5
Li	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.0</u>
TOTAL	14	21	18	23	19.0

7b. Moisture Content, %  
CTM-53B

.015	.005	.060	.010	.023
------	------	------	------	------

7c. Ash Content, %  
CTM-53B

.000	.015	.015	.020	.012
------	------	------	------	------

8a. Filament diameter, microns, WARP  
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE	10.92	10.15	10.72	10.27	10.51
Minimum	9.20	9.20	9.60	9.25	9.21
Maximum	12.25	11.05	11.50	12.05	12.25
Std. Dev	1.12	0.60	0.56	0.84	0.84

WCA Fabric for NASA Lot# 2 (KAISER)9a. Thread Count, per inch, WARP  
PTM-5A

	<u>#2-2S</u>	<u>#2-2E</u>	<u>#2-3S</u>	<u>#2-3E</u>	<u>LOT2 AVG</u>
	30	29	29	29	29.3
	29	29	29	29	29.0
	29	29	30	29	29.3
	29	29	30	29	29.3
	<u>29</u>	<u>29</u>	<u>29</u>	<u>29</u>	<u>29.0</u>
AVG.	29.2	29.0	29.4	29.0	29.2

9b. Thread Count, per inch, FILL  
PTM-5A

	21	22	22	21	21.5
	21	22	22	21	21.5
	21	22	22	21	21.5
	21	22	22	21	21.5
	<u>21</u>	<u>22</u>	<u>22</u>	<u>21</u>	<u>21.5</u>
AVG.	21.0	22.0	22.0	21.0	21.5

10a. Areal Weight as received, gm/4x4  
PTM-3A

LEFT	2.495	2.455	2.579	2.481	2.503
CENTER	2.467	2.435	2.529	2.454	2.471
RIGHT	<u>2.475</u>	<u>2.466</u>	<u>2.553</u>	<u>2.479</u>	<u>2.493</u>
AVG.	2.479	2.452	2.554	2.471	2.489


10b. Volatiles as received, %  
PTM-3A

LEFT	.48	.45	.39	.40	.43
CENTER	.45	.41	.40	.45	.43
RIGHT	<u>.08</u>	<u>.04</u>	<u>.04</u>	<u>.00</u>	<u>.04</u>
AVG.	.34	.30	.27	.28	.30

10c. Weight change on Acetone wash, %  
PTM-3A

LEFT	.28	.25	.19	.20	.23
CENTER	-.04	-.08	-.08	-.04	-.06
RIGHT	<u>-.20</u>	<u>-.12</u>	<u>-.12</u>	<u>-.16</u>	<u>-.15</u>
AVG.	.01	.01	.00	.00	.01

U.S. Polymeric

  
 Hamid M. Quraishi, Manager  
 Quality Assurance Department

DATE 5-20-86

FOOTAGE

LEFT	SPIN	SAMPLE
	327 W	
60		
	85 SPlice	
100		107 ●●
120	135 SPlice	127 ●●
140		
160		
180		194 ●●
200		196 ●●
220		216 ●●
240	228 SPlice	
260	243 ●●	
280	278 SPlice	
300		
320		
340		
360		
380		
400		
420		
440	449 SPlice	
460		
480		492 W
500	509 ●●	
	527 END	SAMPLE

RIGHT

FABRIC WCA GRAPHITE

MFG. ~~CAR~~ UNION CARBIDE

ROLL NO. 293 4CGWCA-2

YARDS 180.0

POUNDS 99.0

ORDER NO. DE71108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 2-2

SYMBOLS

- W W W - TEAR
- ● - SPOTS OR STAINS
- △ △ - FOLDS
- S - EDGE CURL
- I I I - TIGHT WEAVE OR SELVAGE
- W W W - WEAVE DISTORTION
- V V - VISIBLE PUCKERS
- V V - ONE PUCKER CREASING
- V V - TWO OR MORE CREASINES

REMARKS

ORIGINAL PAGE IS  
OF POOR QUALITY

GRADE Group C

*Kiana*

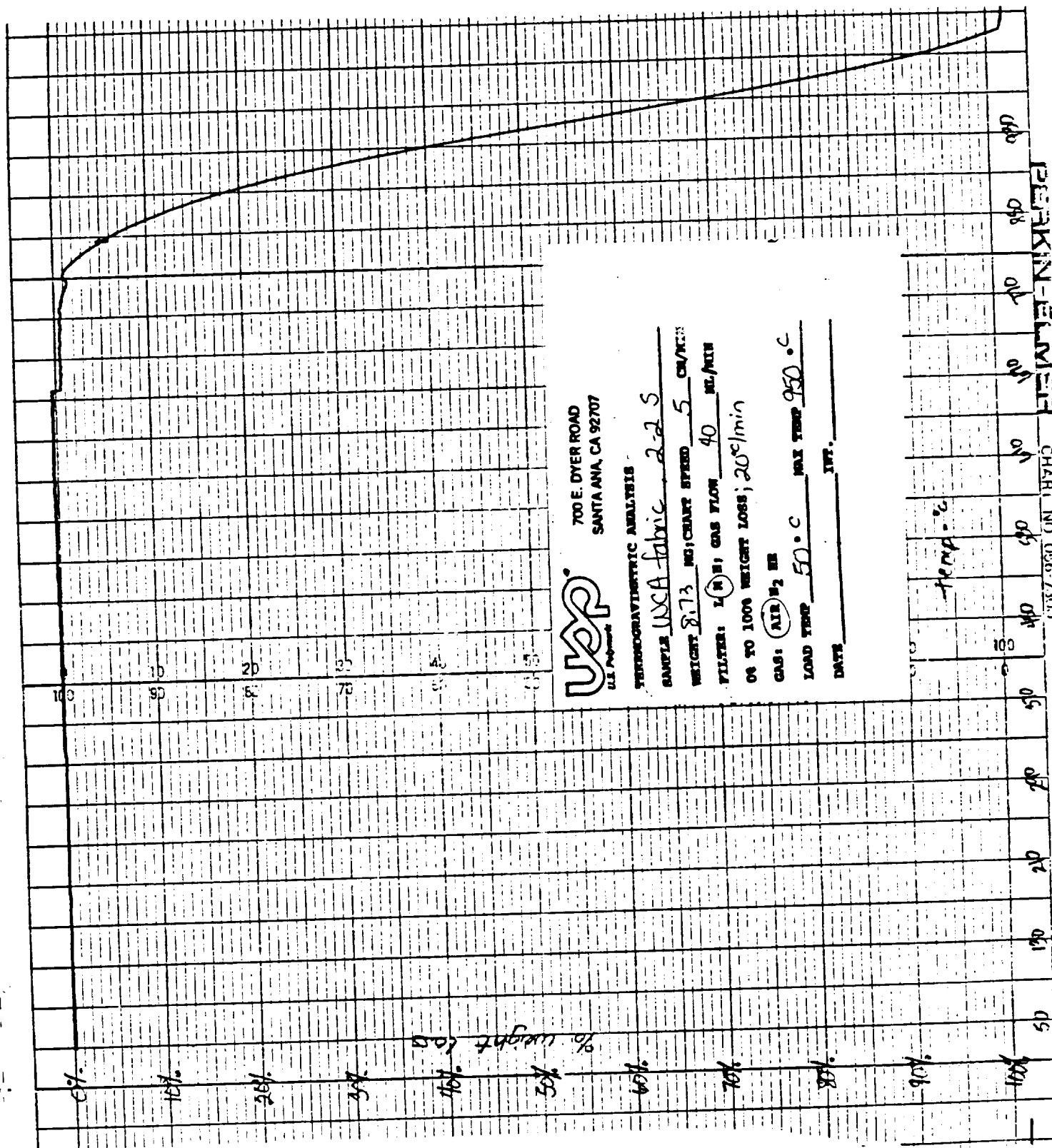
TREATMENT OPERATOR READ UP

DATE 5-20-86

**FOOTAGE**

YARD	START	SAMPLE	LEFT
0			
4			
60			5900
8			
10		72 SPlice	
12		83 AA	
14		102 W	
16		112 W	
18		125 W	
20		130 W	
22		HB W	
24			
26			
28			
30			
32			
34		202 SPlice	
36		216 AA	
38		239 W	
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42		249 W	
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700 E. DYER ROAD  
SANTA ANA, CA 92707

U.S. Patent

THERMOGRAVIMETRIC ANALYSIS

SAMPLE WCA fabric 2-2 S

WEIGHT 8.73 MG; CHART SPEED 5 CM/MIN

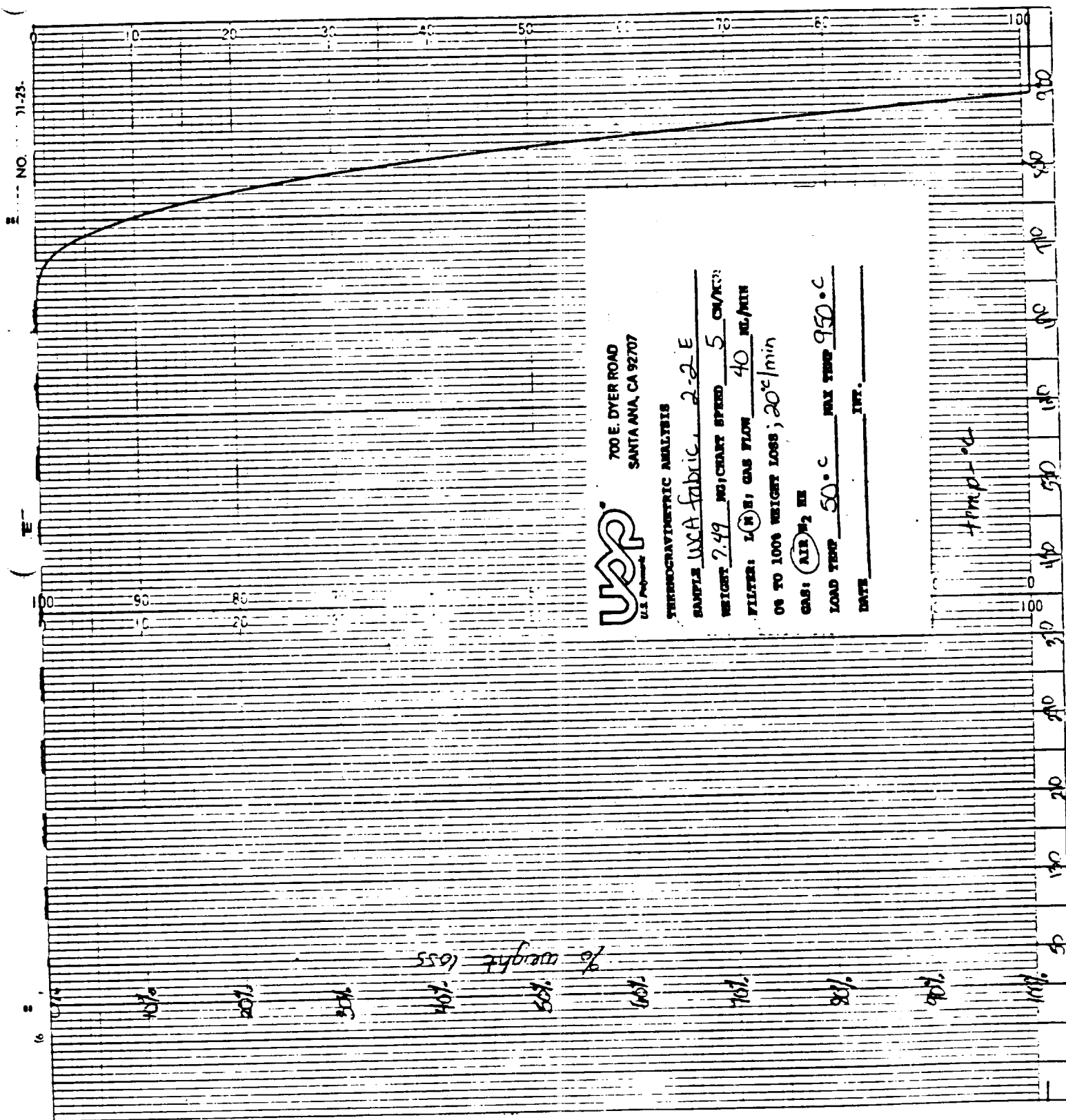
FILTER: 1 (N) H; GAS FLOW 40 ML/MIN

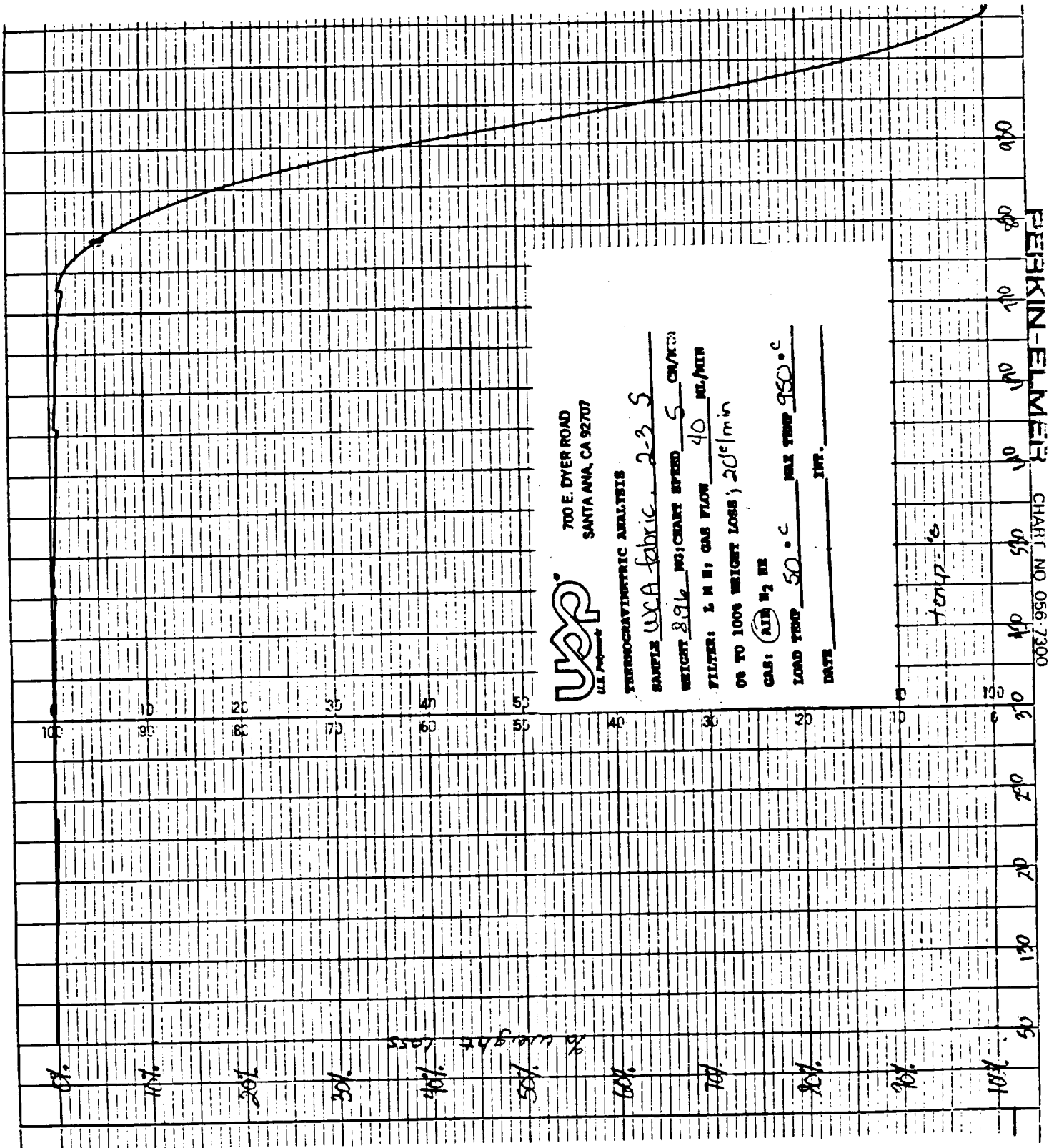
OR TO 100% WEIGHT LOSS; 20 min

GAS: AIR H<sub>2</sub> HE

LOAD TEMP 50 °C MAX TEMP 950 °C

DATE \_\_\_\_\_





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CHART 6D

CHART NO. RN2-01-25-20M

BOLTEC

40°C

% weight loss

**UAP**  
U.S. PATENT OFFICE

700 E. DYER ROAD  
SANTA ANA, CA 92707

TECHNOGRAVIMETRIC ANALYSIS

SAMPLE WCA fabric, 2-3 E

WEIGHT 7.47 MG CHART SPEED 5 CM/MIN

FILTER: 1/4 IN GAS FLOW 40 ML/MIN

O<sub>2</sub> TO 100% WEIGHT LOSS 20 MIN

GAS: AIR N<sub>2</sub> IN

LOAD TEMP 50 °C MAX TEMP 950 °C

DATE \_\_\_\_\_ INT. \_\_\_\_\_

temp - °C

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NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

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## PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)1a. Resin Content, Soxhlet, %  
CTM-6D

ROLL#1	ROLL#1	ROLL#2	ROLL#2	ROLL#3	ROLL#3
<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>
33.4	33.6	33.9	35.6	33.3	33.9
32.6	34.5	33.5	34.8	33.6	33.1
<u>32.2</u>	<u>34.4</u>	<u>34.3</u>	<u>32.8</u>	<u>32.4</u>	<u>33.0</u>
AVG. 32.7	34.2	33.9	34.4	33.1	33.3
			NASA LOT# 2	AVERAGE	33.6

1b. Filler Content, Soxhlet, %  
CTM-6D

13.7	13.8	13.9	14.6	13.7	13.9
13.4	14.2	13.7	14.3	13.8	13.6
<u>13.2</u>	<u>14.1</u>	<u>14.1</u>	<u>13.5</u>	<u>13.3</u>	<u>13.5</u>
AVG. 13.4	14.0	13.9	14.1	13.6	13.7
			NASA LOT# 2	AVERAGE	13.8

1c. Cloth Content, Soxhlet, %  
CTM-6D

52.9	52.6	52.2	49.8	53.0	52.2
54.0	51.3	52.8	50.9	52.6	53.3
<u>54.6</u>	<u>51.5</u>	<u>51.6</u>	<u>53.7</u>	<u>54.3</u>	<u>53.5</u>
AVG. 53.8	51.8	52.2	51.5	53.3	53.0
			NASA LOT# 2	AVERAGE	52.6

2. Volatile Content, %  
PTM-17B

2.7	2.5	2.3	2.5	2.4	2.6
2.7	2.6	2.5	2.5	2.5	2.4
<u>2.8</u>	<u>2.7</u>	<u>2.7</u>	<u>2.6</u>	<u>2.5</u>	<u>2.3</u>
AVG. 2.7	2.6	2.5	2.5	2.5	2.4
			NASA LOT# 2	AVERAGE	2.5

3. Flow, 1000 psi, %  
PTM-19G

18.2	17.2	17.0	16.8	17.8	15.3
17.8	17.8	16.7	16.1	17.5	16.0
<u>17.9</u>	<u>17.4</u>	<u>17.7</u>	<u>17.0</u>	<u>16.6</u>	<u>15.5</u>
AVG. 18.0	17.5	17.1	16.6	17.3	15.6
			NASA LOT# 2	AVERAGE	17.0

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

4. Resin Content, Dry Basis, %  
PTM-16F, Type II

ROLL#1	ROLL#1	ROLL#2	ROLL#2	ROLL#3	ROLL#3
<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>
33.5	34.6	34.8	34.6	33.8	33.8
33.3	35.1	35.3	35.2	34.6	33.2
<u>34.1</u>	<u>35.8</u>	<u>35.8</u>	<u>35.3</u>	<u>34.4</u>	<u>33.3</u>
AVG. 33.6	35.2	35.3	35.0	34.3	33.4
NASA LOT# 2				AVERAGE	34.5

5. Tack, lbs  
PTM-80

46	40	36	26	30	24
NASA LOT# 2				AVERAGE	34

6. Gel Time, Seconds  
PTM-20E

75	61	58	87	78	54
NASA LOT# 2				AVERAGE	69

7a. Atomic Absorption, ppm  
CTM-53B

	ROLL#1	ROLL#1	ROLL#2	ROLL#2	ROLL#3	ROLL#3	LOT#2
	<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>	<u>AVG.</u>
Na	6	7	6	8	7	6	7
K	0	1	1	1	1	1	1
Ca	7	9	7	13	8	12	9
Mg	1	2	1	2	2	2	2
Li	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
TOTAL	14	19	15	24	18	21	19

7b. Moisture Content, %  
CTM-53B

ROLL#1	ROLL#1	ROLL#2	ROLL#2	ROLL#3	ROLL#3
<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>
1.93	2.03	1.99	1.92	1.89	1.78
NASA LOT# 2				AVERAGE	1.92

7c. Ash Content, %  
CTM-53B

.03	.05	.08	.02	.03	.06
NASA LOT# 2				AVERAGE	.04

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

8. TGA, % Weight Loss at 500°C  
CTM-51 (Nitrogen)

ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
8.7	9.3	9.2	9.3	8.6	9.8

NASA LOT# 2 AVERAGE 9.2

See Chart 8A-8F

9. DSC, °C  
CTM-50A

183	184	184	185	184	183
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NASA LOT# 2 AVERAGE 184

See Chart 9A-9F

10. Infrared (IRZB) Baseline  
CTM-21C

.83	.82	.81	.80	.78	.77
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NASA LOT# 2 AVERAGE .80

See Chart 10A-10F

11. Environmental History

Date manufactured: 30 May 1986  
Packaged in: MIL-B-131 Class I  
bag supported in  
cardboard carton  
Date shipped: 31 July 1986 in  
40°F truck

12. Specific Gravity, Cured, Units  
ASTM D 792

1.431	1.435	1.432	1.435	1.433	1.432
1.430	1.433	1.432	1.435	1.432	1.430
<u>1.430</u>	<u>1.433</u>	<u>1.432</u>	<u>1.435</u>	<u>1.433</u>	<u>1.430</u>
AVG. 1.430	1.434	1.432	1.435	1.432	1.431

NASA LOT# 2 AVERAGE 1.432

13a. Tensile Strength, ksi, WARP  
FTMS 406-1011

18.74	18.64	19.84	20.24	18.59	19.64
18.88	20.26	19.20	18.37	19.69	18.91
21.49	19.20	19.12	18.66	19.94	18.20
20.07	18.20	19.04	19.66	17.38	19.34
<u>21.17</u>	<u>18.72</u>	<u>18.86</u>	<u>18.29</u>	<u>20.76</u>	<u>18.48</u>
AVG. 20.07	19.00	19.21	19.04	19.27	18.91

NASA LOT# 2 AVERAGE 19.25



FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

13b. Tensile Modulus, msi, WARP  
FTMS 406-1011

ROLL#1 <u>START</u>	ROLL#1 <u>END</u>	ROLL#2 <u>START</u>	ROLL#2 <u>END</u>	ROLL#3 <u>START</u>	ROLL#3 <u>END</u>
2.15	2.14	2.21	2.09	2.21	2.46
2.19	2.12	2.18	2.04	2.10	2.54
2.06	1.98	2.21	2.14	2.33	2.47
2.32	2.13	2.02	2.08	2.09	2.25
<u>2.22</u>	<u>2.01</u>	<u>2.11</u>	<u>2.16</u>	<u>2.14</u>	<u>2.14</u>
AVG. 2.19	2.08	2.15	2.10	2.17	2.37

NASA LOT# 2 AVERAGE 2.18

13c. Tensile Elongation, %, WARP  
FTMS 406-1011

1.00	1.10	1.16	1.09	1.05	1.02
.87	1.23	1.18	1.12	1.22	.96
1.09	1.04	.99	1.10	1.14	.94
.93	1.00	1.14	1.08	1.07	.88
<u>1.15</u>	<u>1.06</u>	<u>1.02</u>	<u>1.05</u>	<u>1.29</u>	<u>1.03</u>
AVG. 1.01	1.09	1.10	1.09	1.15	.97

NASA LOT# 2 AVERAGE 1.07

14a. Flexural Strength, Ksi, WARP  
FTMS 406-1031

28.36	28.03	28.20	29.18	31.72	27.38
29.22	29.56	28.52	35.07	30.60	26.91
29.15	28.84	27.17	33.20	31.62	26.57
28.46	29.81	29.68	32.07	32.55	25.98
<u>30.25</u>	<u>30.04</u>	<u>29.20</u>	<u>29.76</u>	<u>32.24</u>	<u>25.68</u>
AVG. 29.09	29.26	28.55	31.86	31.75	26.50

NASA LOT# 2 AVERAGE 29.50

14b. Flexural Modulus, msi, WARP  
FTMS 406-1031

2.19	2.06	2.03	2.11	2.11	1.86
2.34	2.05	2.01	2.28	2.19	1.98
2.15	1.93	2.02	2.13	2.06	1.87
2.04	2.05	1.95	2.23	2.24	1.96
<u>2.25</u>	<u>2.03</u>	<u>1.88</u>	<u>2.11</u>	<u>2.15</u>	<u>1.90</u>
AVG. 2.19	2.02	1.98	2.17	2.15	1.91

NASA LOT# 2 AVERAGE 2.07

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

15a. Compressive Strength, ksi, WARP  
FTMS 406-1021

ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
22.11	22.55	17.04	24.22	25.35	20.23
19.69	19.48	23.02	18.64	24.50	19.61
20.84	24.58	23.02	20.68	24.83	18.35
18.34	23.89	23.54	25.67	23.67	20.27
<u>20.81</u>	<u>22.74</u>	<u>23.56</u>	<u>24.19</u>	<u>24.20</u>	<u>20.00</u>
AVG. 20.36	22.65	22.04	22.68	24.51	19.69

NASA LOT# 2 AVERAGE 21.99

15b. Compressive Modulus, ksi, WARP  
FTMS 406-1021

2.05	2.02	2.13	2.20	2.05	2.08
2.03	2.08	2.10	2.29	1.99	2.20
2.09	2.06	2.05	2.35	2.14	2.20
2.14	2.04	2.05	2.23	2.00	2.12
<u>2.02</u>	<u>2.00</u>	<u>2.03</u>	<u>2.21</u>	<u>2.06</u>	<u>2.27</u>
AVG. 2.07	2.04	2.07	2.26	2.05	2.17

NASA LOT# 2 AVERAGE 2.11

16. Double Shear Strength, ksi  
FTMS 406-1041A

2.40	2.87	2.60	2.69	2.15	2.70
2.47	3.07	2.96	2.51	2.42	2.43
2.56	2.93	2.79	2.91	2.49	2.59
2.43	2.72	2.77	2.60	2.41	2.58
<u>2.68</u>	<u>2.76</u>	<u>2.66</u>	<u>2.60</u>	<u>2.37</u>	<u>2.55</u>
AVG. 2.51	2.87	2.75	2.66	2.36	2.57

NASA LOT# 2 AVERAGE 2.62

17. Barcol Hardness, Units  
ASTM D-2583  
(Average of 10 determinations)

59.2	59.9	57.1	55.2	63.0	60.6
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NASA LOT# 2 AVERAGE 59.2

18. Residual Volatiles, %  
PTM-98

1.31	1.32	1.34	1.50	1.31	1.28
1.45	1.29	1.35	1.31	1.34	1.29
<u>1.32</u>	<u>1.46</u>	<u>1.51</u>	<u>1.37</u>	<u>1.33</u>	<u>1.29</u>
AVG. 1.36	1.36	1.40	1.40	1.33	1.29

NASA LOT# 2 AVERAGE 1.35

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

19. Resin Content, Pyrolysis, %  
CTM-14B

ROLL#1	ROLL#1	ROLL#2	ROLL#2	ROLL#3	ROLL#3
<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>	<u>START</u>	<u>END</u>
29.70	31.74	32.23	31.64	31.92	30.67
30.11	33.43	33.15	32.19	31.72	30.38
<u>31.13</u>	<u>32.96</u>	<u>31.89</u>	<u>32.06</u>	<u>31.53</u>	<u>30.46</u>
AVG. 30.32	32.71	32.42	31.96	31.72	30.50
NASA LOT# 2 AVERAGE					31.61

20. Acetone Extraction, %  
CTM-18A

4.55	5.78	6.19	5.23	5.61	5.33
5.15	6.14	4.56	4.49	6.25	4.48
<u>5.40</u>	<u>6.87</u>	<u>5.02</u>	<u>5.77</u>	<u>5.00</u>	<u>4.83</u>
AVG. 5.03	6.26	5.26	5.17	5.62	4.88
NASA LOT# 2 AVERAGE					5.37

21a. CTE, 1n/1n °F, with PLY  
PTM-61B

2.66	3.06	3.80	2.71	2.77	2.96
<u>2.94</u>	<u>3.92</u>	<u>4.14</u>	<u>2.73</u>	<u>1.96</u>	<u>2.41</u>
AVG. 2.80	3.49	3.97	2.72	2.37	2.69
NASA LOT# 2 AVERAGE					3.01

21b CTE, 1n/1n °F, Cross PLY  
PTM-61B

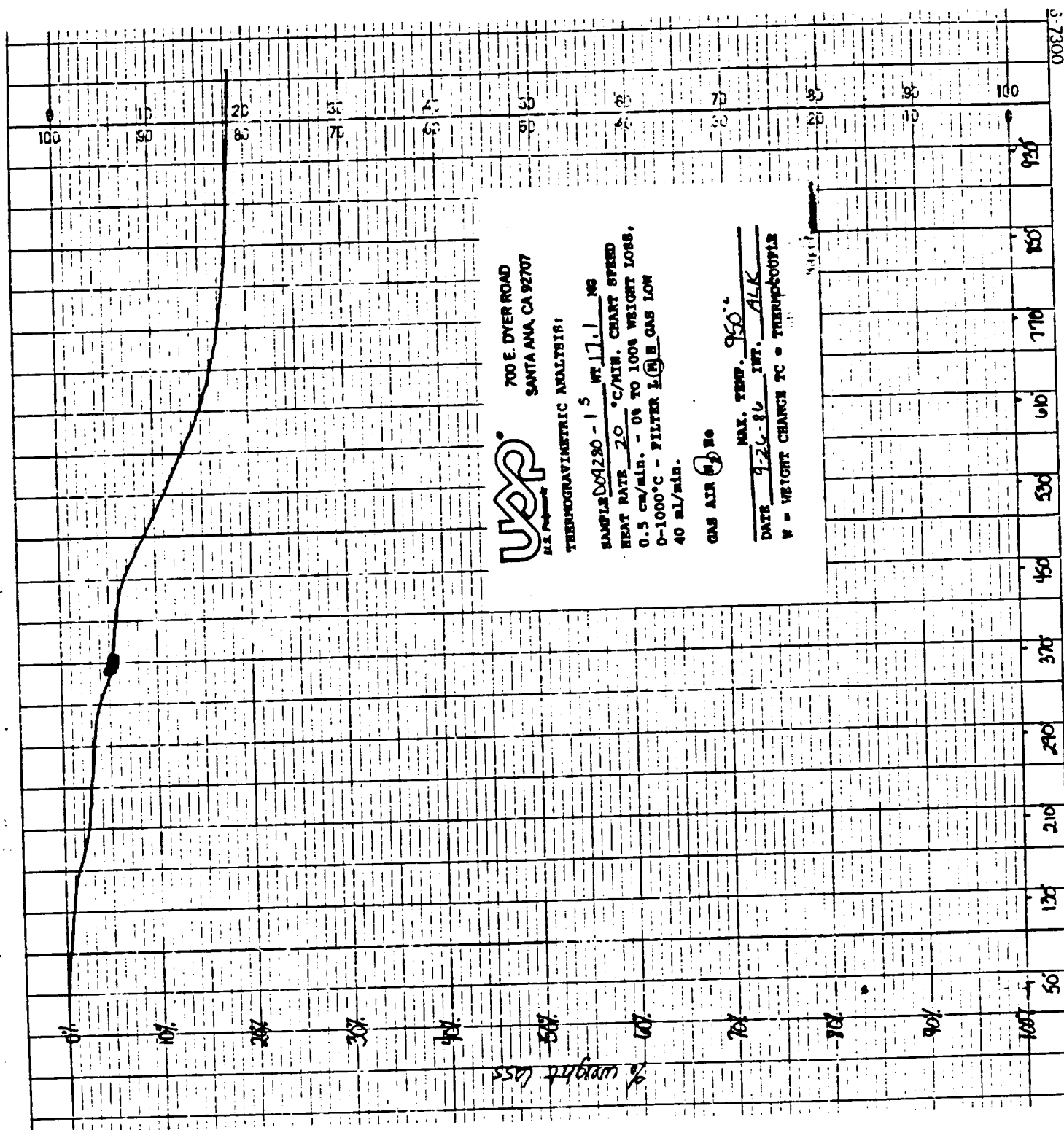
7.21	6.15	6.66	2.88	3.05	3.34
<u>3.45</u>	<u>4.18</u>	<u>4.24</u>	<u>3.12</u>	<u>2.13</u>	<u>3.83</u>
AVG. 5.33	5.17	5.45	3.00	2.59	3.59
NASA LOT# 2 AVERAGE					4.19

See Chart 21A-21F

U.S. Polymeric

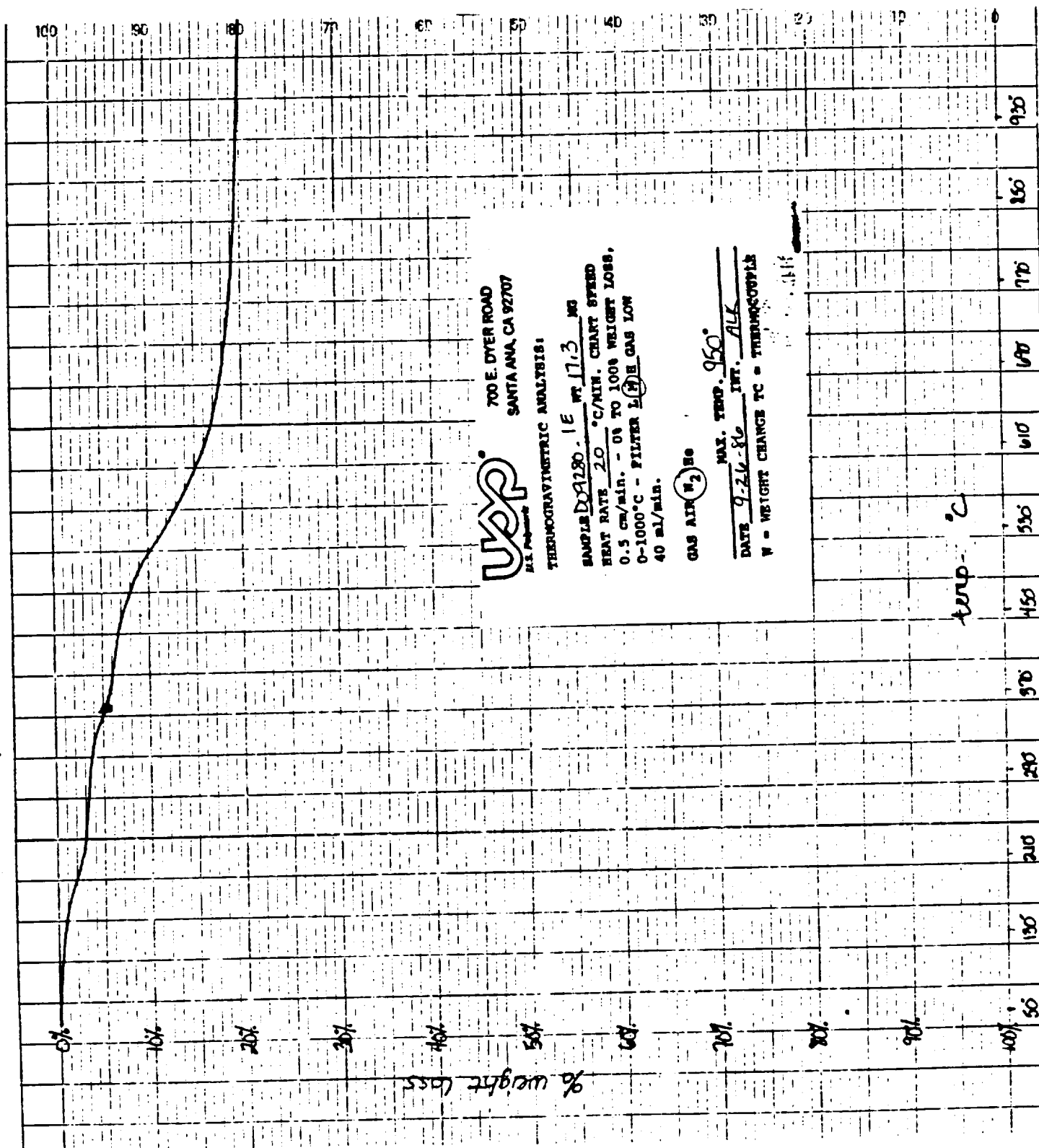


Hamid M. Quraishi, Manager  
Quality Assurance Department



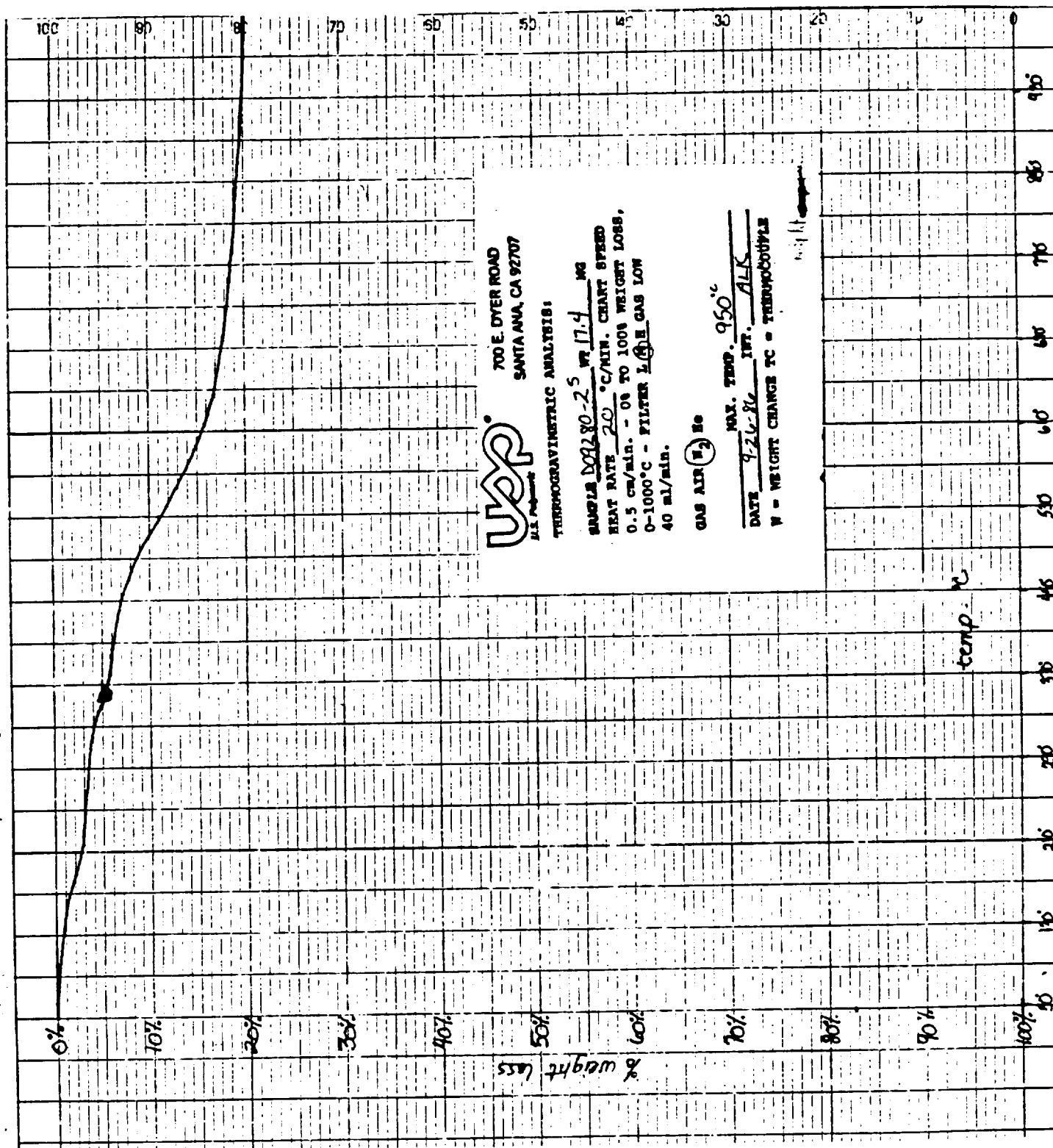
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PEAKIN-ELMER

CHART NO. 02



700 E. DYER ROAD  
SANTA ANA, CA 92707

U.S. Patents THERMOGRAVIMETRIC ANALYSIS

SAMPLE DOA280-25 WT 17.4 MG  
HEAT RATE 20 °C/MIN. CHART SPEED  
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,  
0-1000°C - FILTER 1/8" E GAS LOW  
40 ml/min.

GAS AIR (2) cc

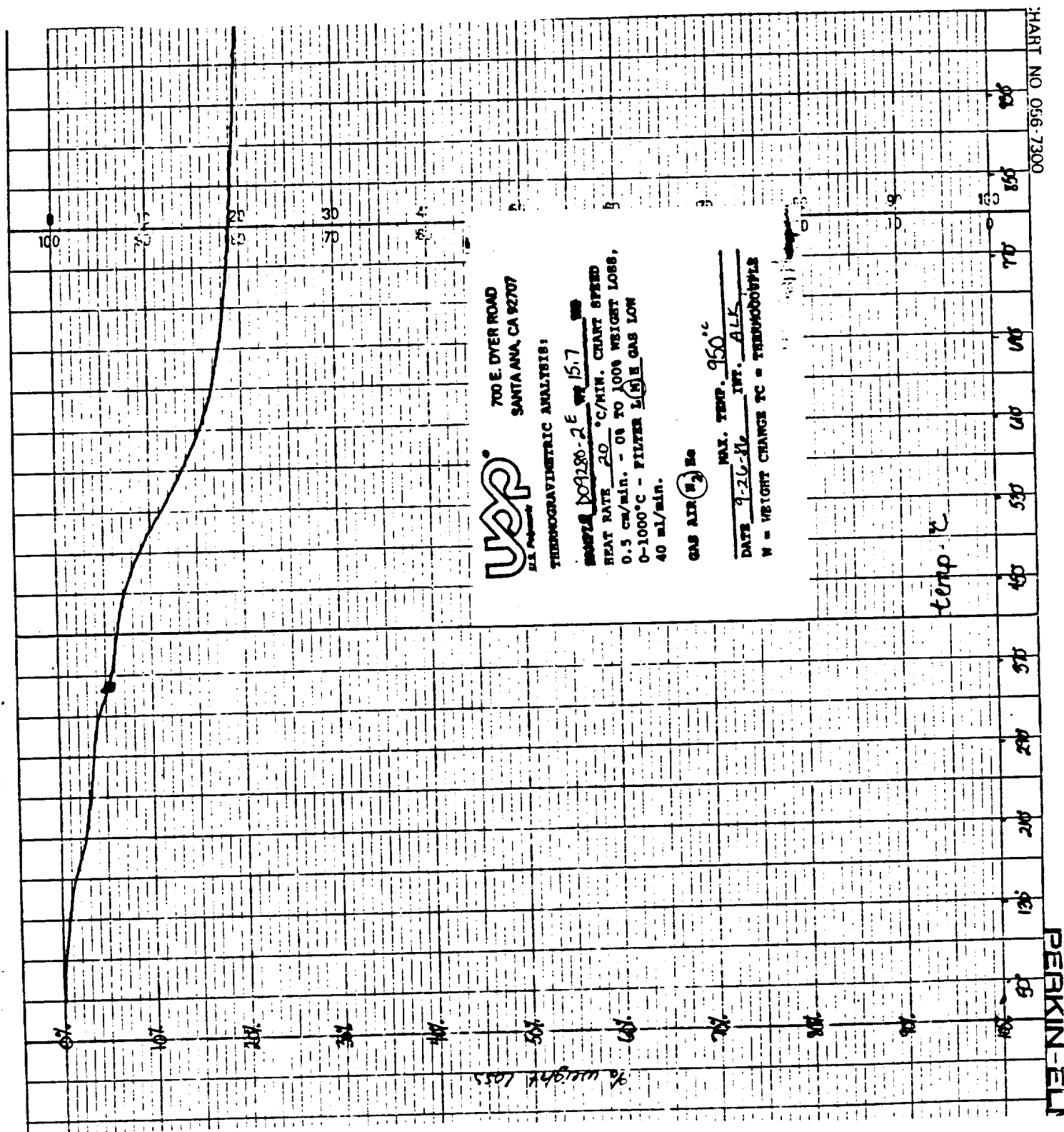
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DATE 9-26-86 INT. ALK  
W = WEIGHT CHANGE TC = THERMOCOUPLE

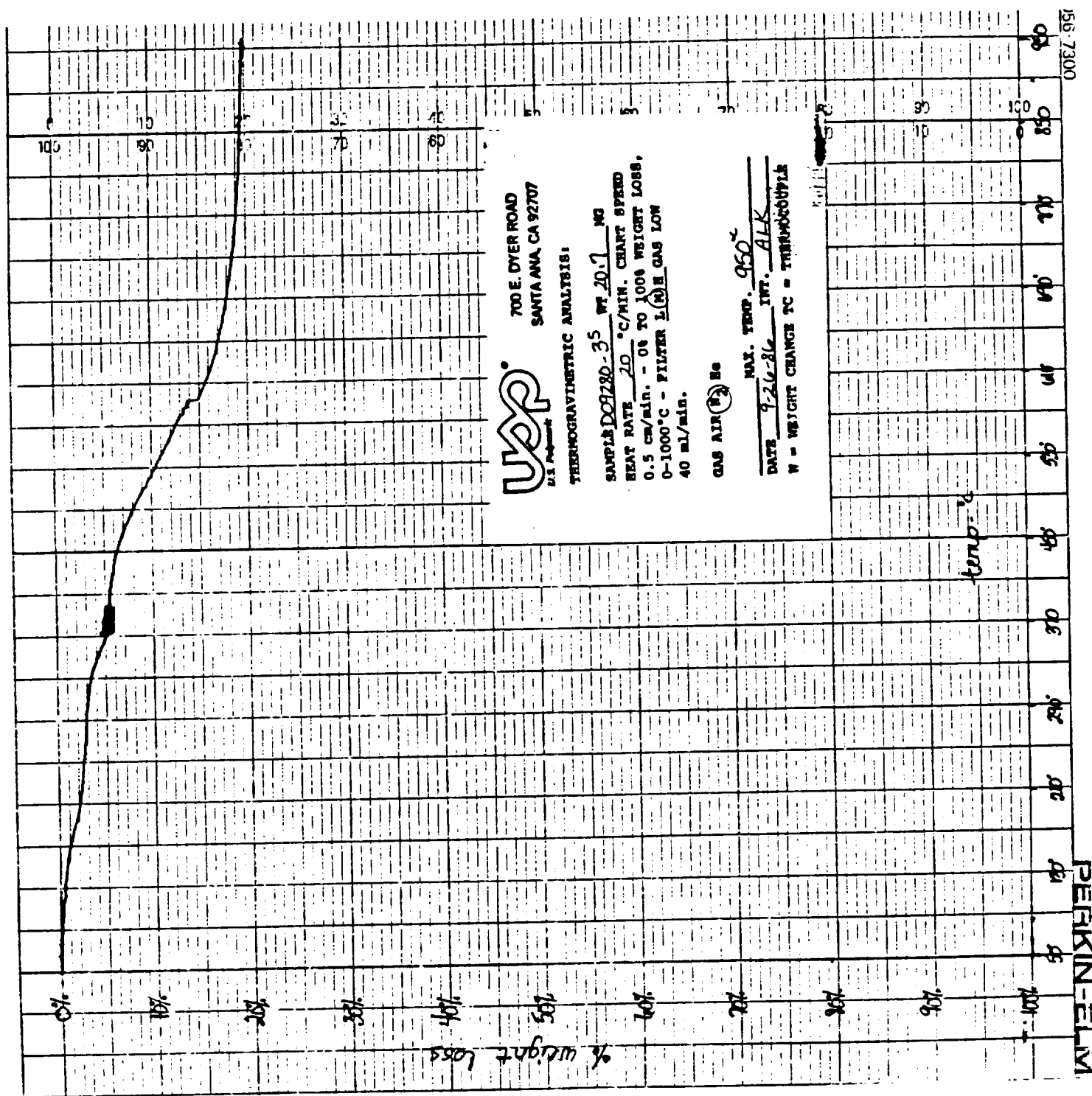
temp. °C

PERKIN-ELMER CHART NO.

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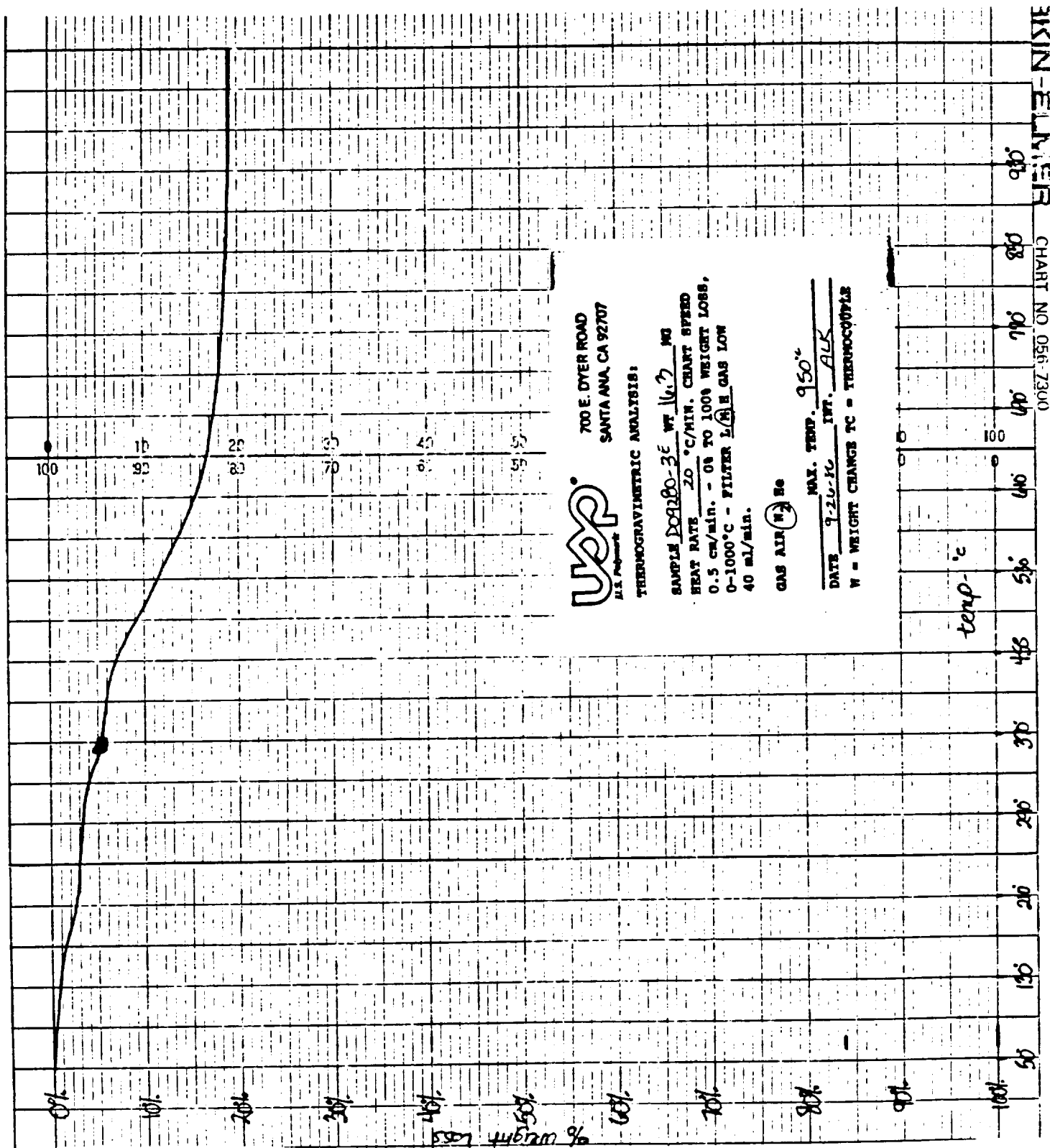
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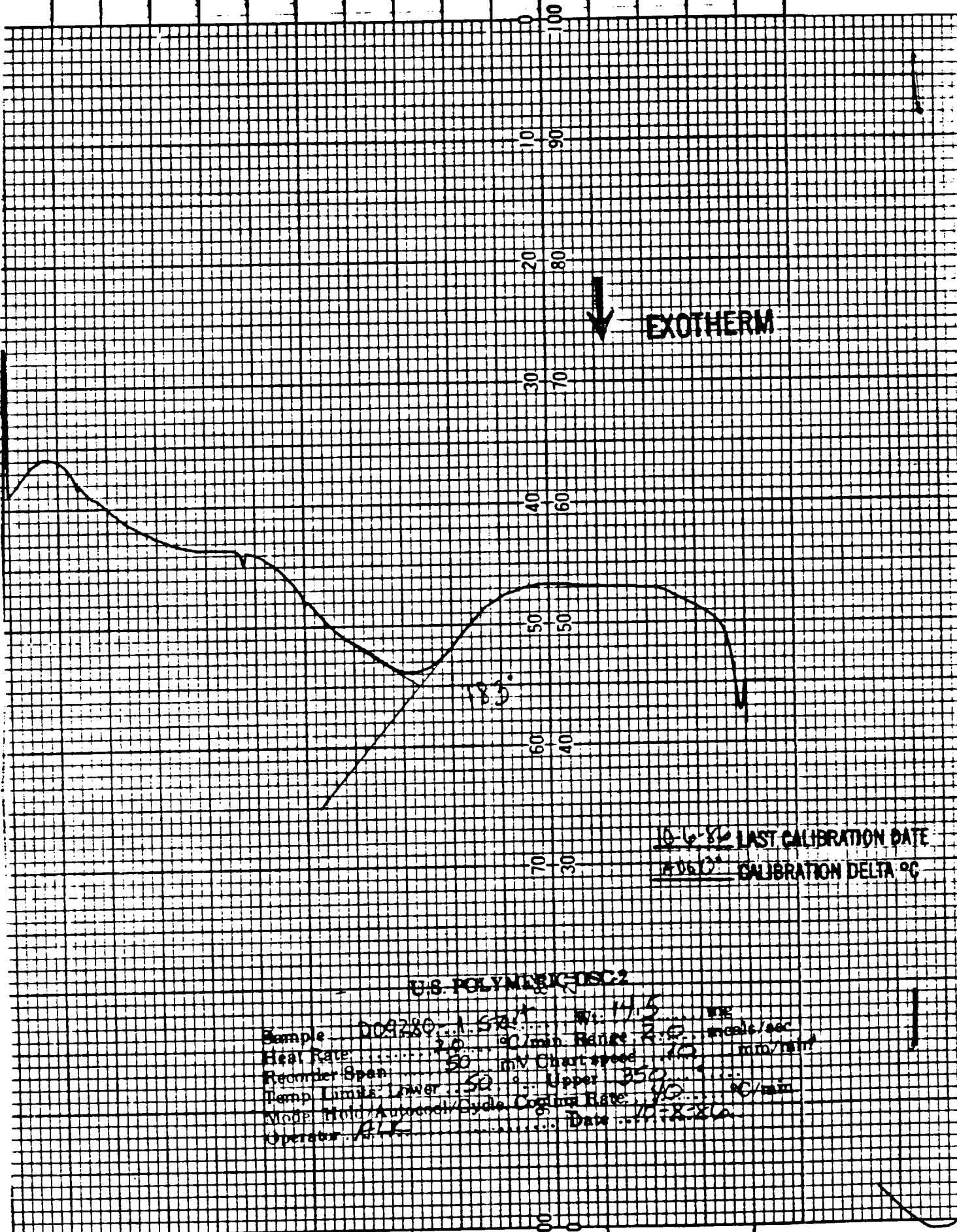






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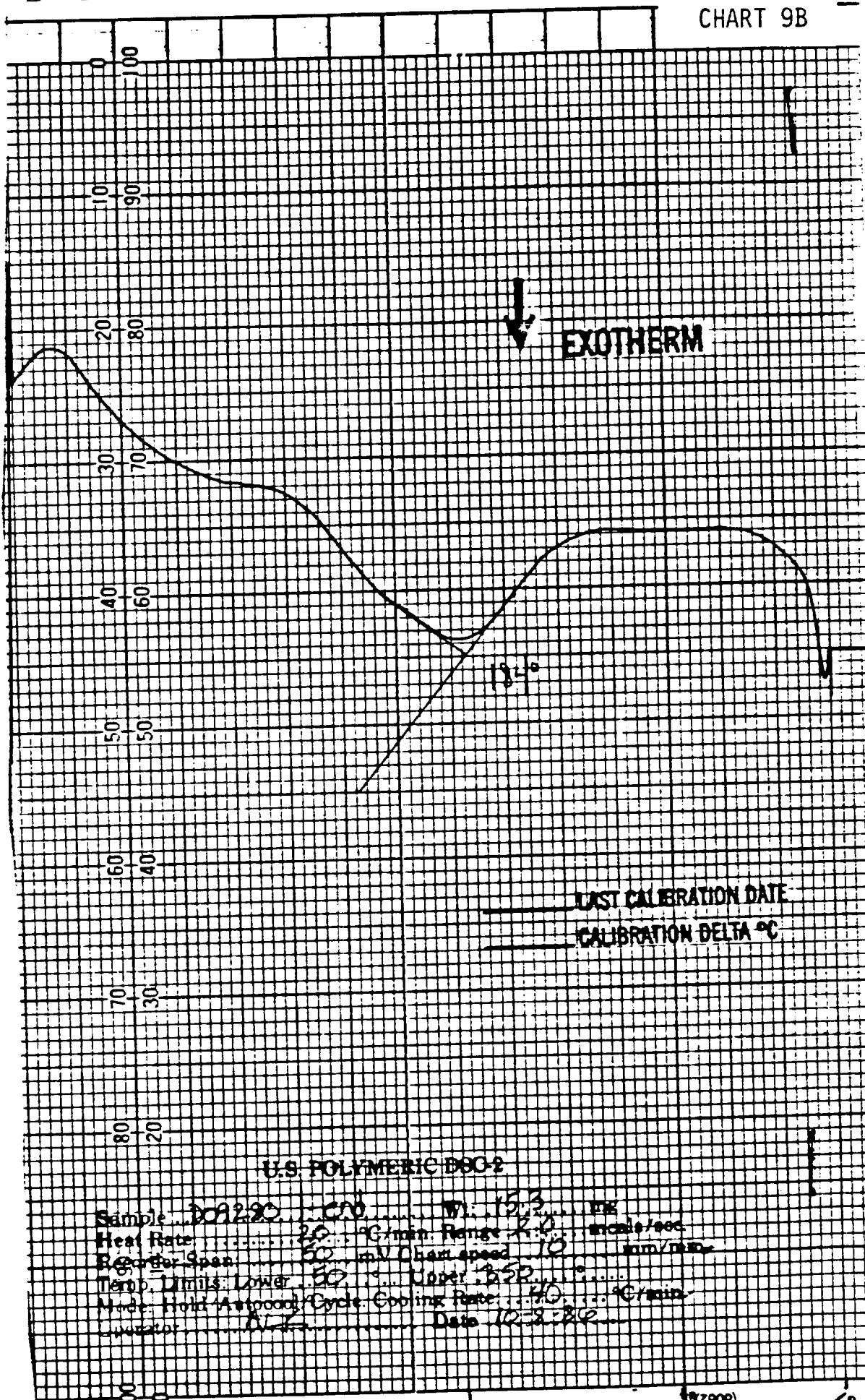


10-6-82 LAST CALIBRATION DATE  
10610 CALIBRATION DELTA °C

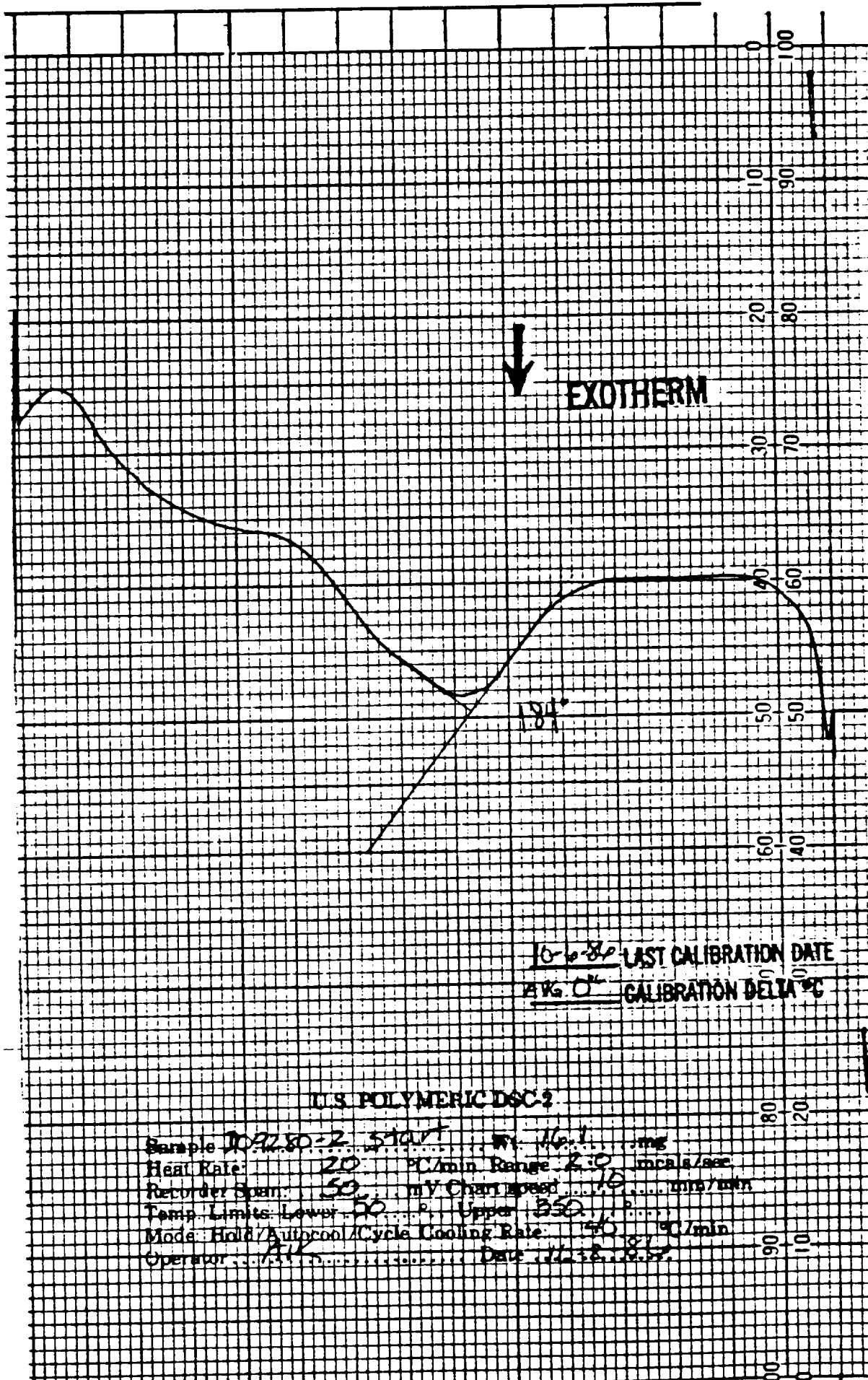
U.S. POLYMER OSC2

Sample D09280-1 Start Wt. 17.5 mg  
Heat Rate 20 °C/min Range 2.0 mV/sec  
Recorder Span 50 mV Chart speed 10 mm/min  
Temp Limits Lower 50 Upper 350 °C  
Mode Hold/Approach/Cycle Cooling Rate 10 °C/min  
Operator A.K. Date 10-2-86

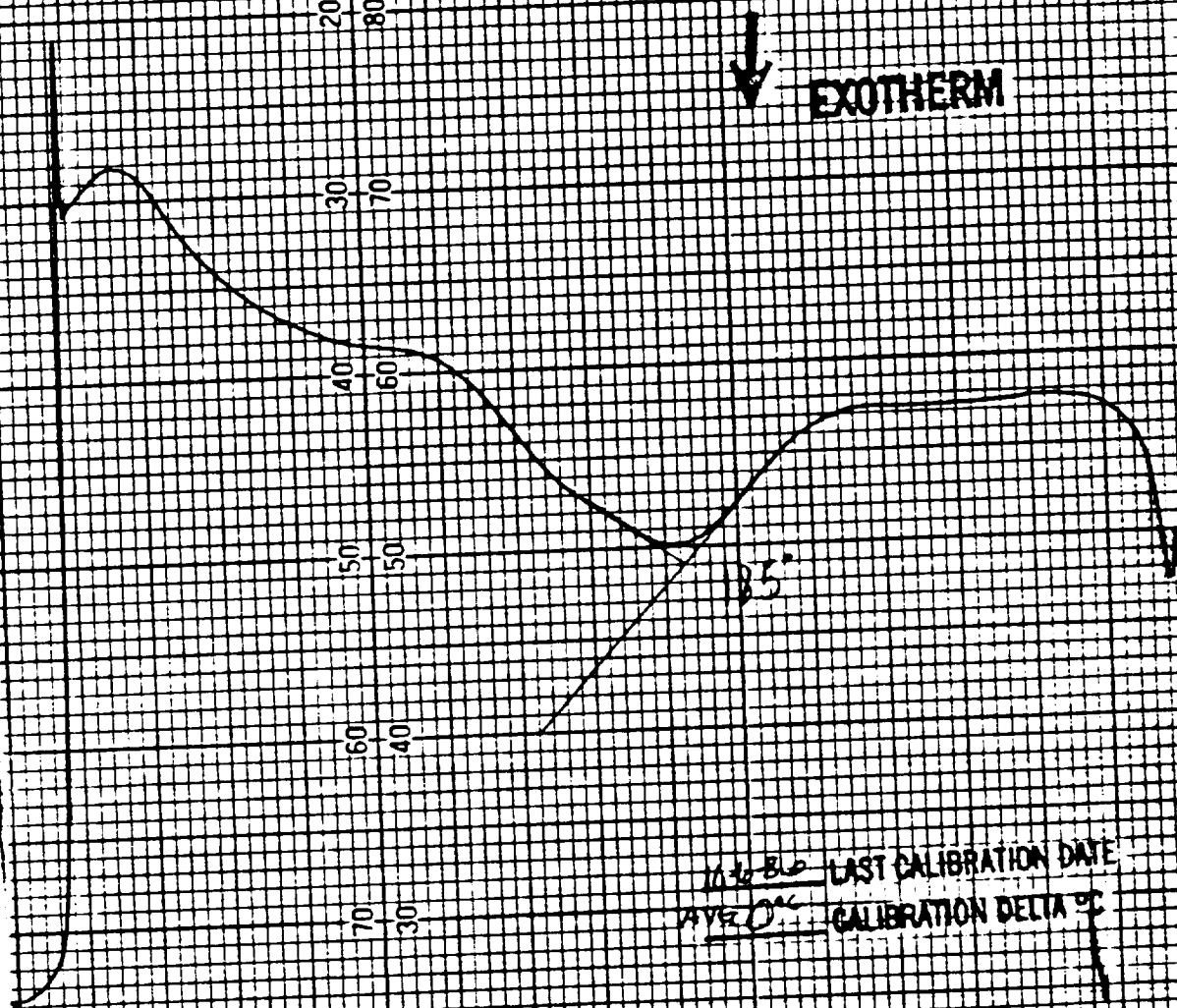
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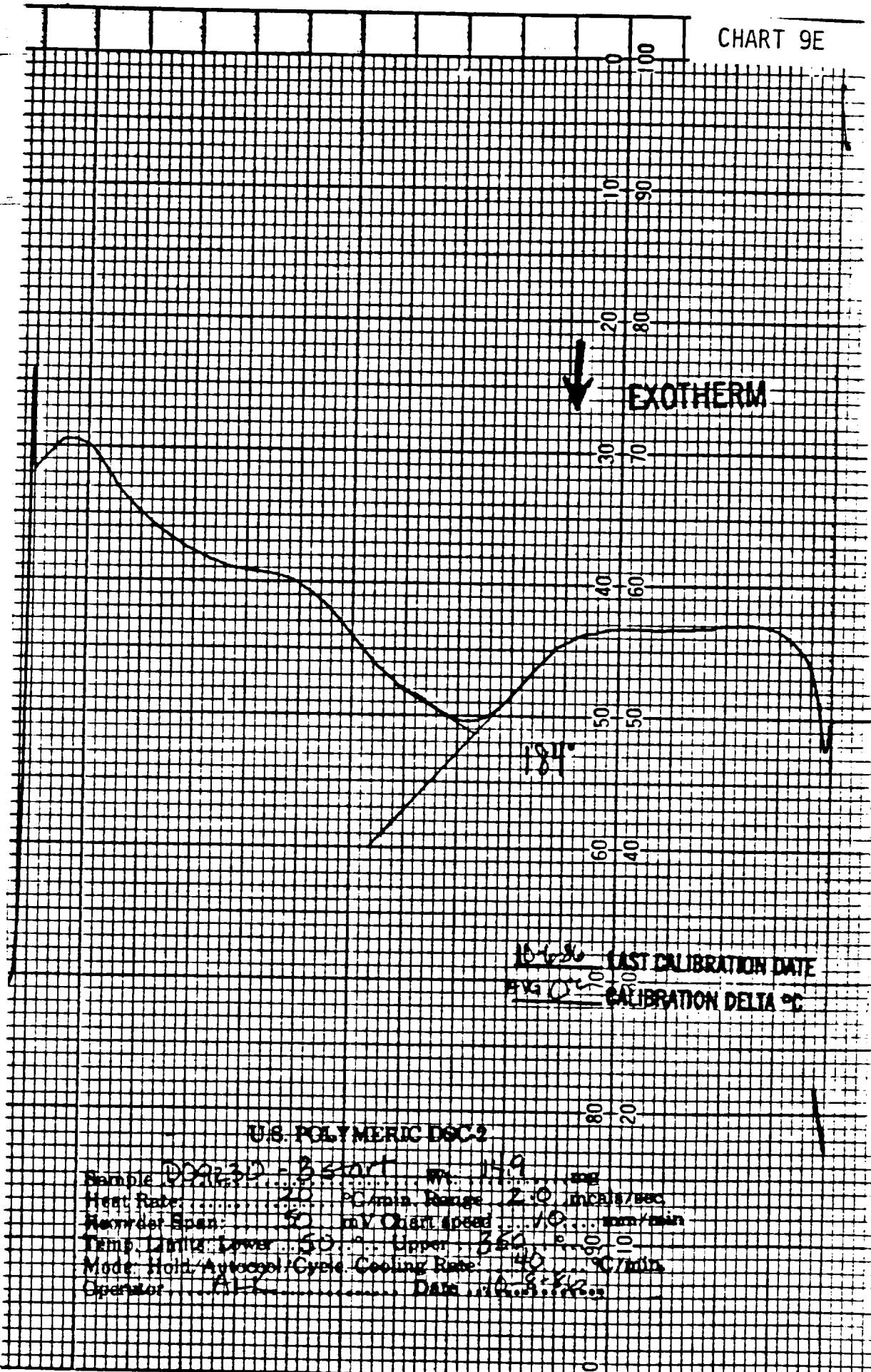
10/14/80 LAST CALIBRATION DATE  
AYE 0°C CALIBRATION DELTA °C

U.S. POLYMERIC DSC2

Sample DSC-20-2 end ... 15.6 mg  
Heat Rate: 20 °C/min Range 2.0 mW/sec  
Recorder Span: 60 mV Chart speed: 10 mm/min  
Temp Limits Lower: 50 Upper: 350  
Mode: Hold/Autycool Cycle Cooling Rate: 10 °C/min  
Operator: ALK Date: 10-8-80

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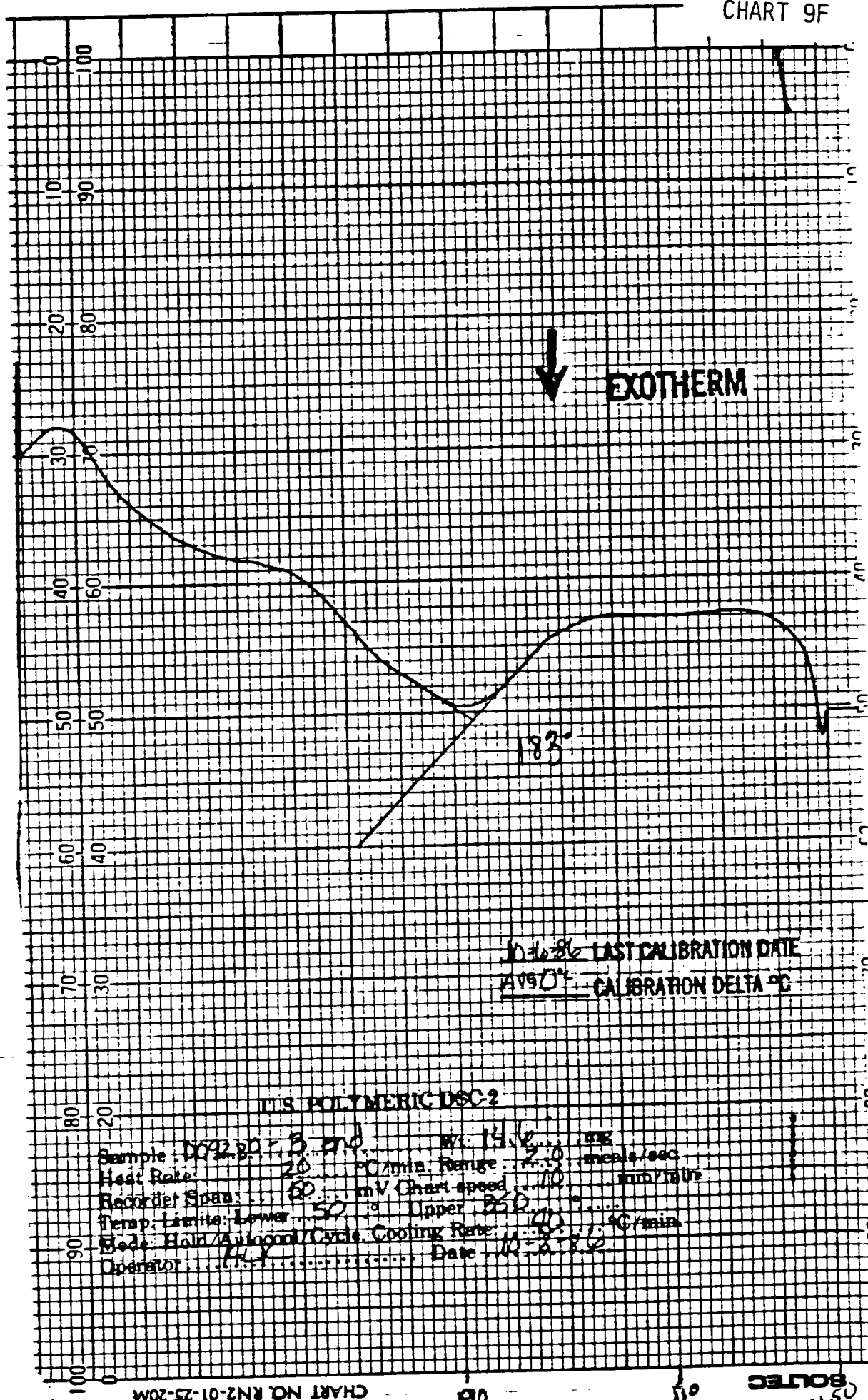
CHART 9E



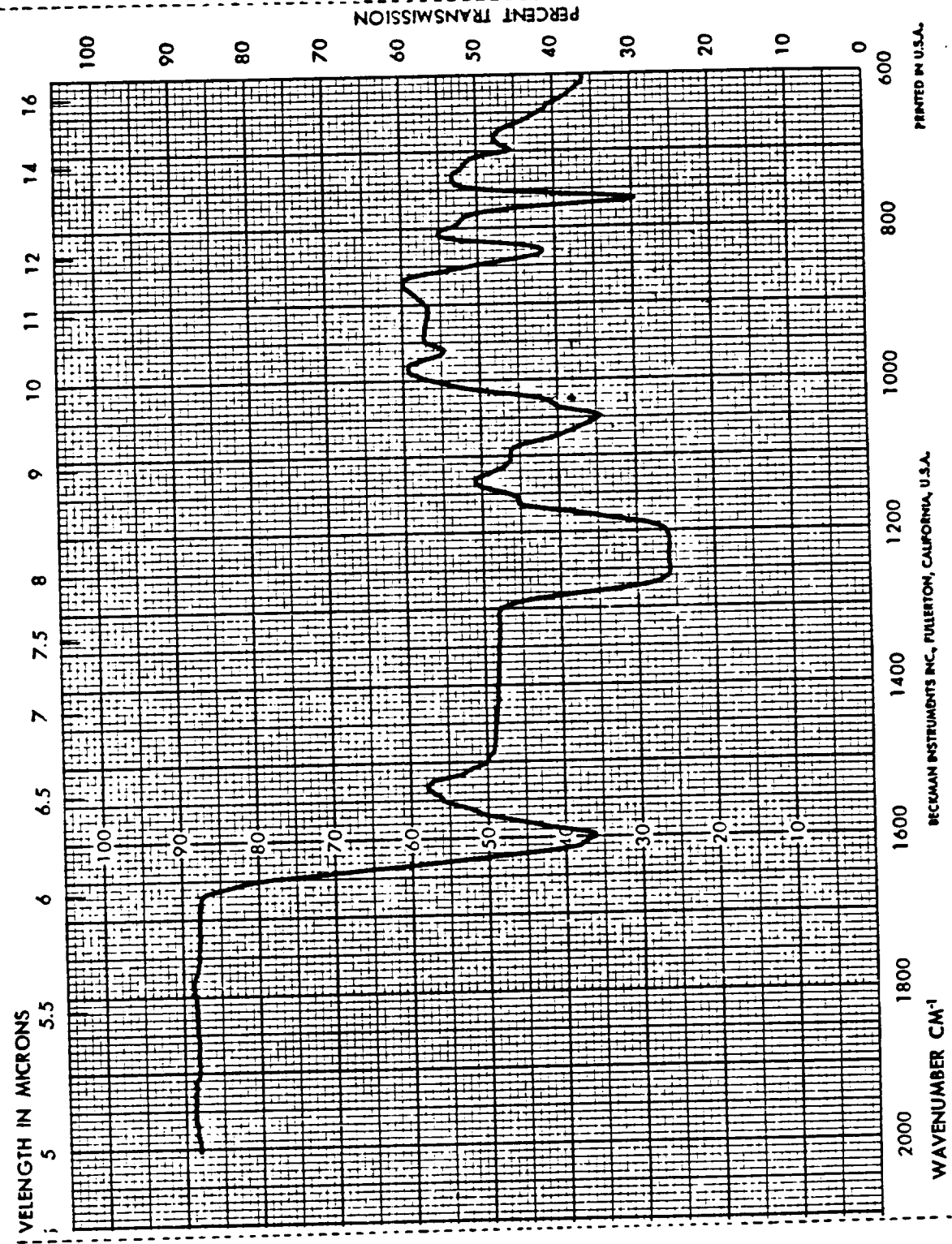
U.S. POLYMERIC DSC-2

Sample 009230-3 start 149 mg  
Heat Rate: 20 °C/min. Range 2.0 mCal/sec  
Heater Span: 50 mV Chart speed 10 mm/min  
Temp Limit: Lower 50 Upper 350 °C  
Mode: Hold/AutoCool/Cycle Cooling Rate 40 °C/min  
Operator AK Date 10-8-80





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SPECTRUM NO. 15189  
 DATE 7-07-86  
 SAMPLE FM 5064 J  
D09280 # 5T-1  
 SOURCE \_\_\_\_\_  
 STRUCTURE \_\_\_\_\_

PATH 0.2 mm NaCl  
 SOLVENT ACETONE  
 CONCENTRATION 30-50%  
 PHASE 3  
 COMMENTS PRE-PROD  
MATERIAL

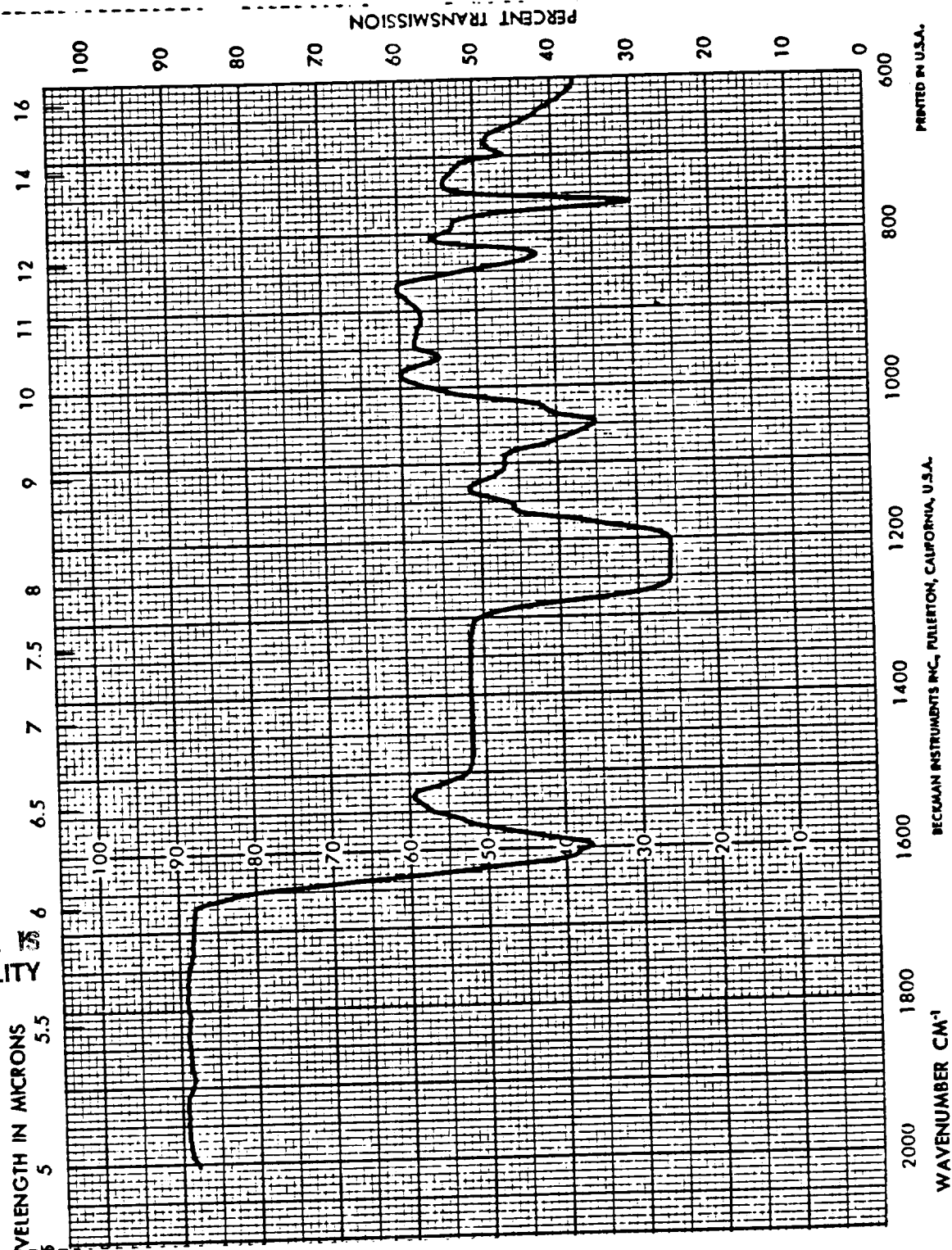
ANALYST V. MIRANDA



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SPECTROPHOTOMETER



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WAVENUMBER  $\text{CM}^{-1}$ 

SPECTRUM NO. 151910  
 DATE 7-03-86  
 SAMPLE FM 504A1  
DDQ280 #E-1  
 SOURCE \_\_\_\_\_  
 STRUCTURE \_\_\_\_\_

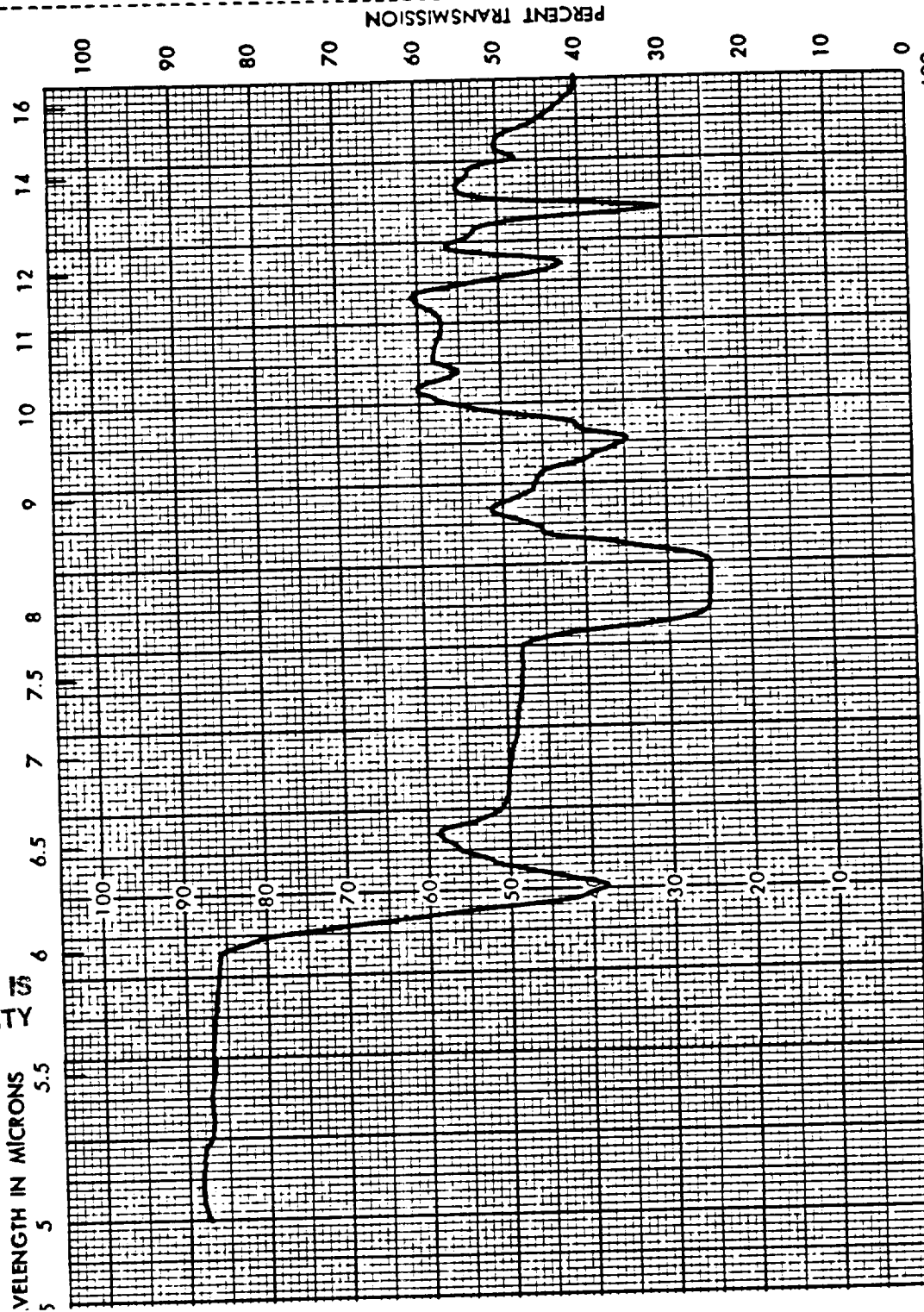
PATH 0.2 mm NaCl  
 SOLVENT ACETONE  
 CONCENTRATION 30-50%  
 PHASE 3  
 COMMENTS PREP  
MATERIAL

ANALYST V. MIRANDA

**Beckman®**

INFRARED  
SPECTROPHOTOMETER

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SPECTRUM NO. 15191  
 DATE 1-07-66  
 SAMPLE FM 5064 J  
DO9280 #5T-2  
 \_\_\_\_\_  
 SOURCE \_\_\_\_\_  
 STRUCTURE \_\_\_\_\_

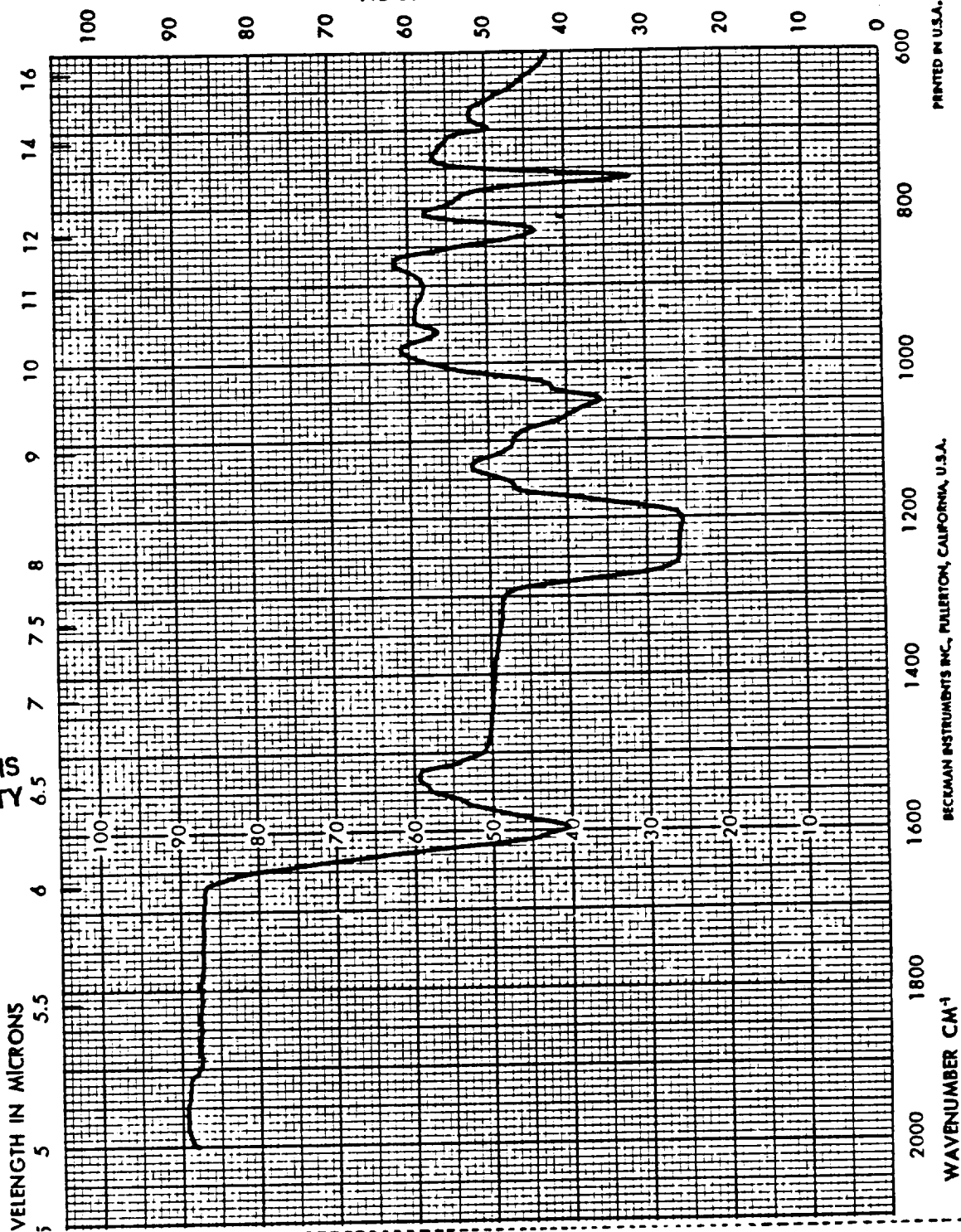
PATH 0.2 mm NaCl  
 SOLVENT ACETONE  
 CONCENTRATION 30-50%  
 PHASE 3  
 COMMENTS PRE-PREG  
MATERIAL  
 \_\_\_\_\_

ANALYST Y. MIRANDA



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SPECTROPHOTOMETER

ORIGINAL PAGE IS  
OF POOR QUALITY



SPECTRUM NO. 15192  
DATE 7-07-86  
SAMPLE PM 5064 J  
D09280-#E2  
SOURCE \_\_\_\_\_  
STRUCTURE \_\_\_\_\_  
PATH 0.2 mm NaCl  
SOLVENT ACETONE  
CONCENTRATION 30-50%  
PHASE 3  
COMMENTS PRE-PROD  
MATERIAL  
ANALYST V. MIRANDA

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SPECTROPHOTOMETER

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SPECTRUM NO. 15193  
DATE 7-03-86  
SAMPLE FM 50641  
009280 # 51-3

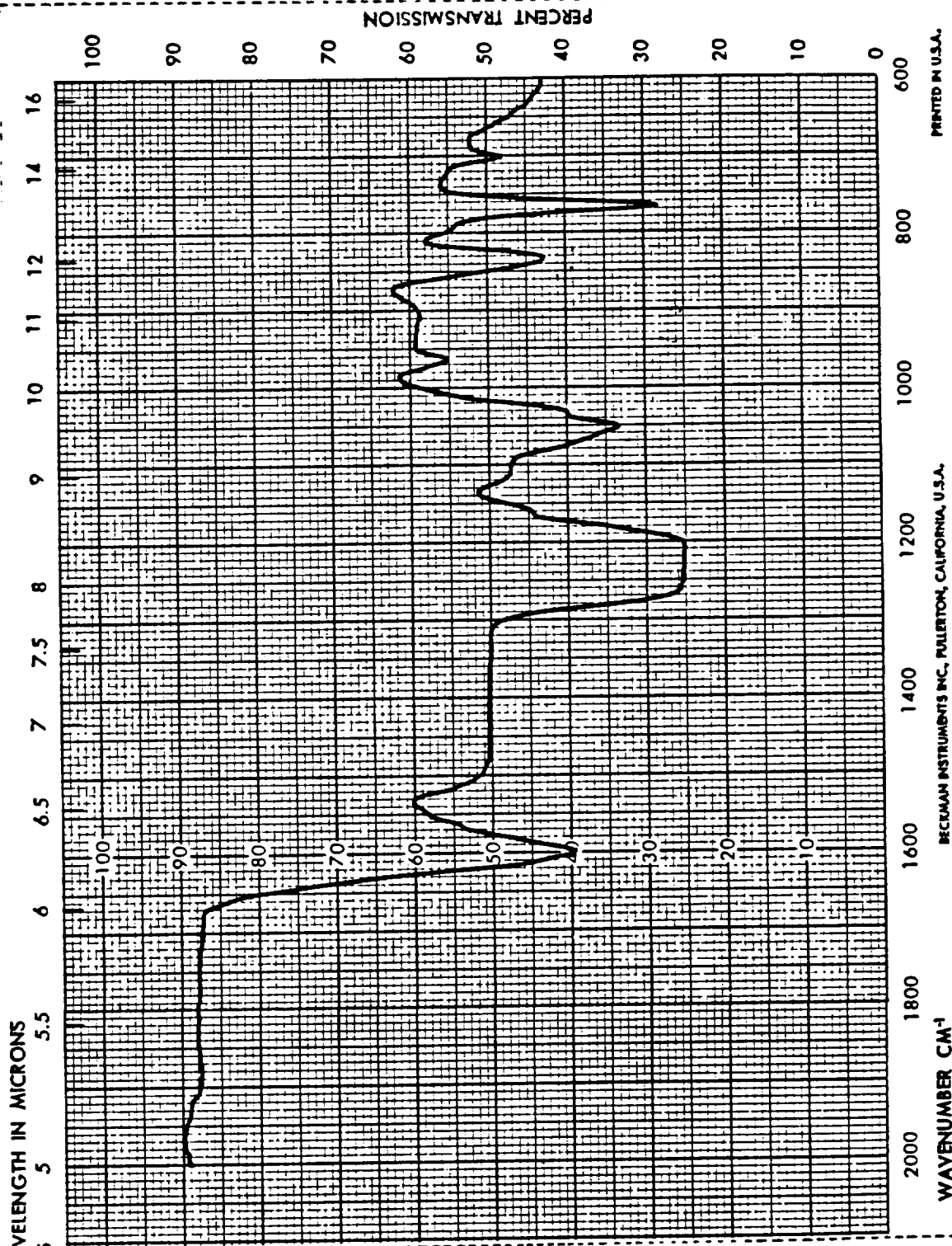
SOURCE \_\_\_\_\_  
STRUCTURE \_\_\_\_\_

PATH 0.2 mm NACL  
SOLVENT ACETONE  
CONCENTRATION 30-50%  
PHASE 3  
COMMENTS PRE-PREG  
MATERIAL

ANALYST Y. MIRANDA

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SPECTROPHOTOMETER

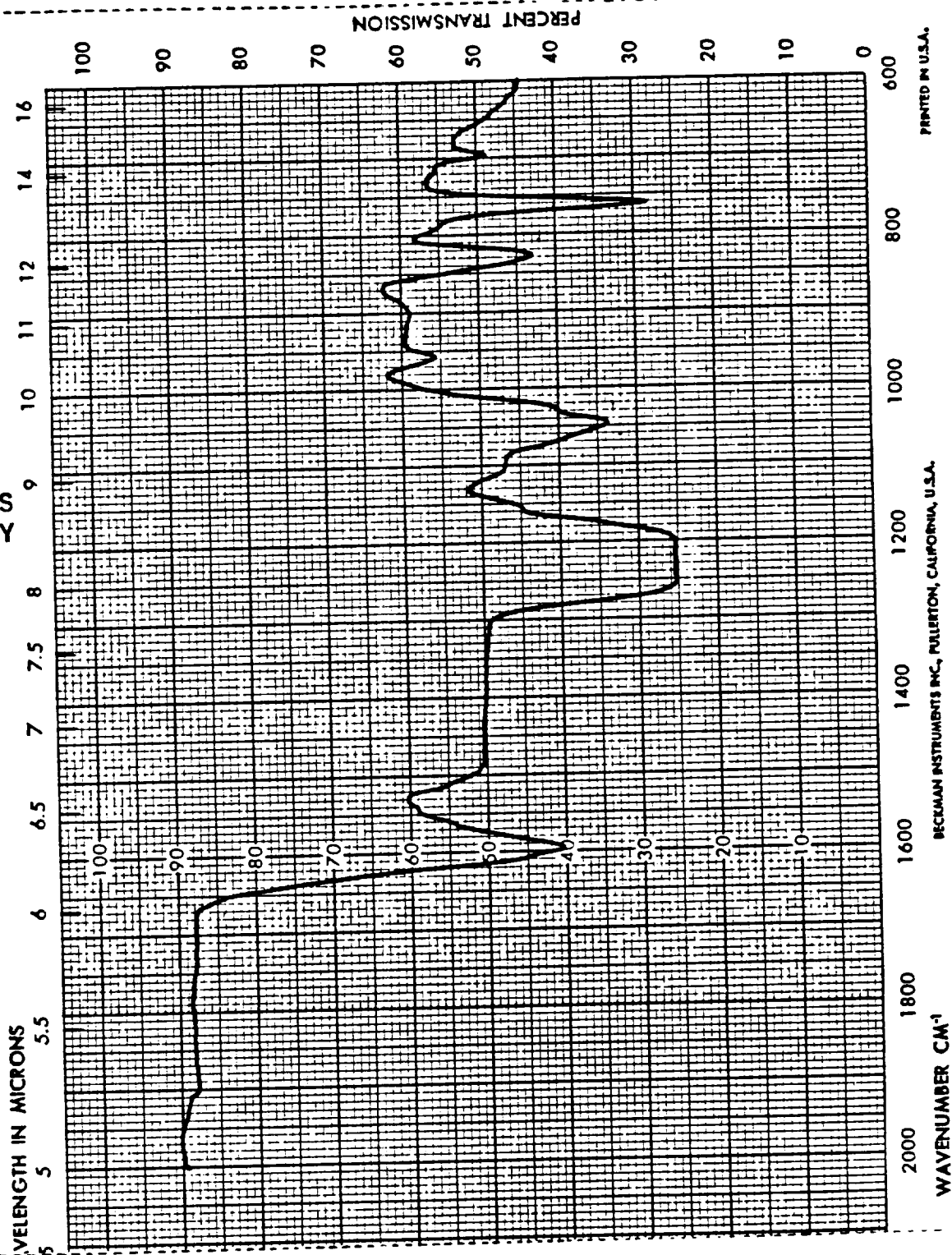


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CHART 10E

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SPECTRUM NO. 15194  
 DATE 7-03-86  
 SAMPLE FM 5064-A  
D09200 #E-3  
 SOURCE \_\_\_\_\_  
 STRUCTURE \_\_\_\_\_

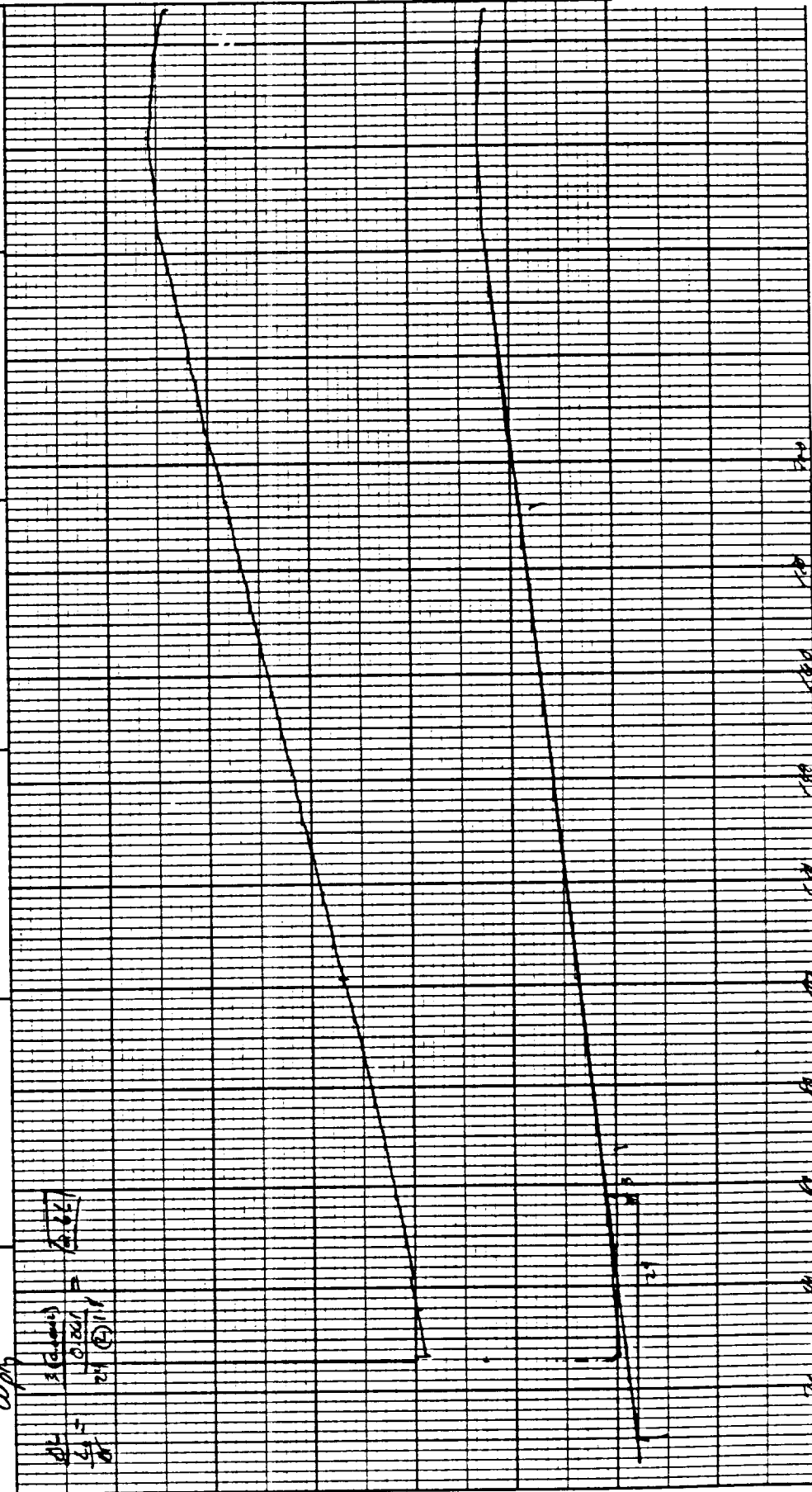
PATH 0.3 mm NaCl  
 SOLVENT ACETONE  
 CONCENTRATION 30-50%T  
 PHASE 3  
 COMMENTS PRE-REG  
MATERIAL  
 ANALYST V. MIRANDA

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SPECTROPHOTOMETER

PART NO. 990068

RUN NO. _____ OPERATOR <u>TR</u> SAMPLE <u>D09100-1-SH15 (1)</u> ATM <u>Atc</u> <u>0</u> <u>500</u> FLOW RATE <u>2.5</u> <u>SCCM</u>	T-AXIS SCALE, °C/in. <u>20</u> PROG RATE, °C/min <u>10</u> HEAT <input checked="" type="checkbox"/> COOL <input type="checkbox"/> ISO <input type="checkbox"/> SHIFT, in. <u>0</u>	DTA-DSC SCALE, °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST, sec _____ dY, (mg/min)/in. _____	TMA <u>Sec/min</u> SCALE, mils/in. <u>0.1/0.2</u> MODE <u>Exhaust</u> SAMPLE SIZE <u>0.261</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in. _____
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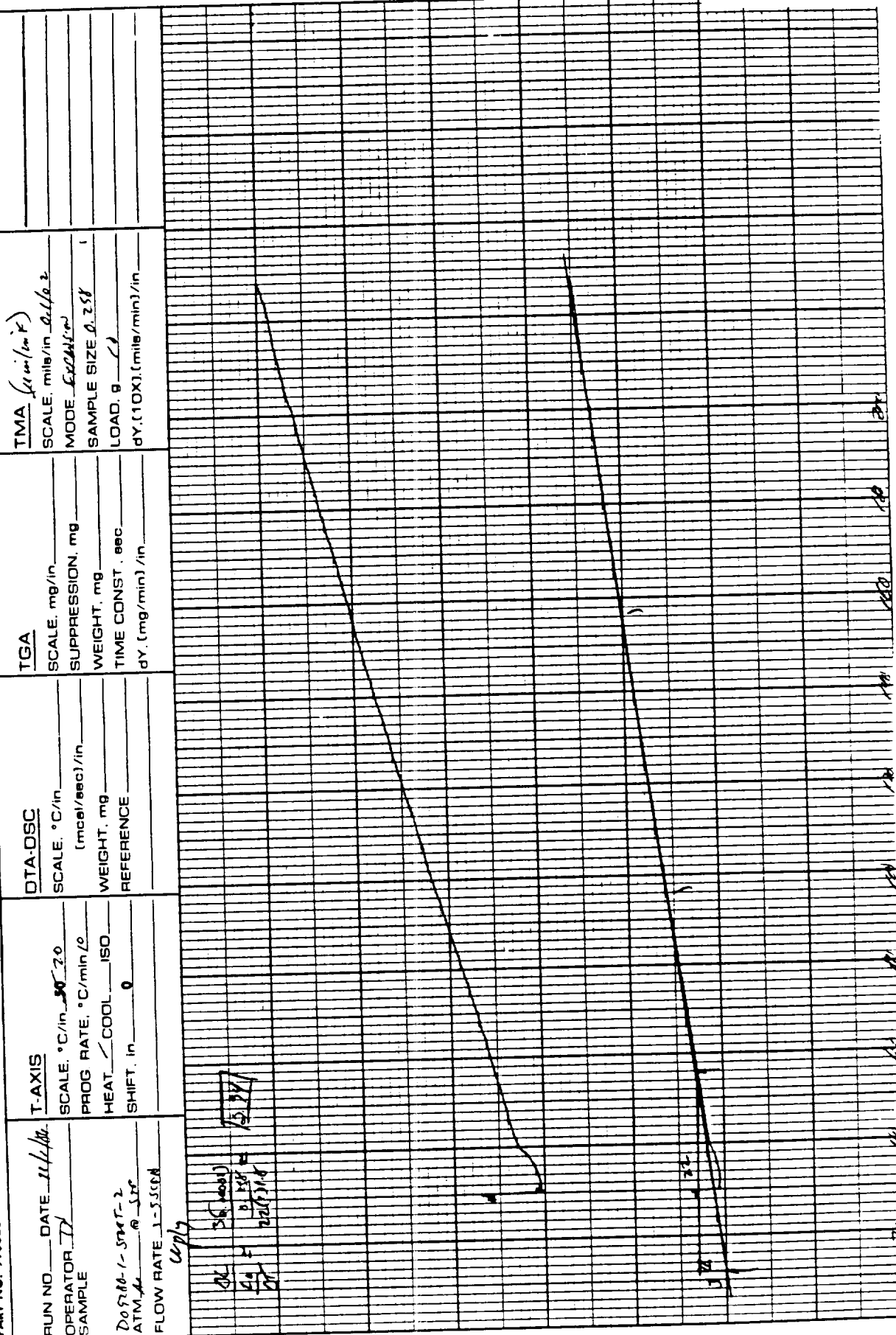


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PART NO. 990088



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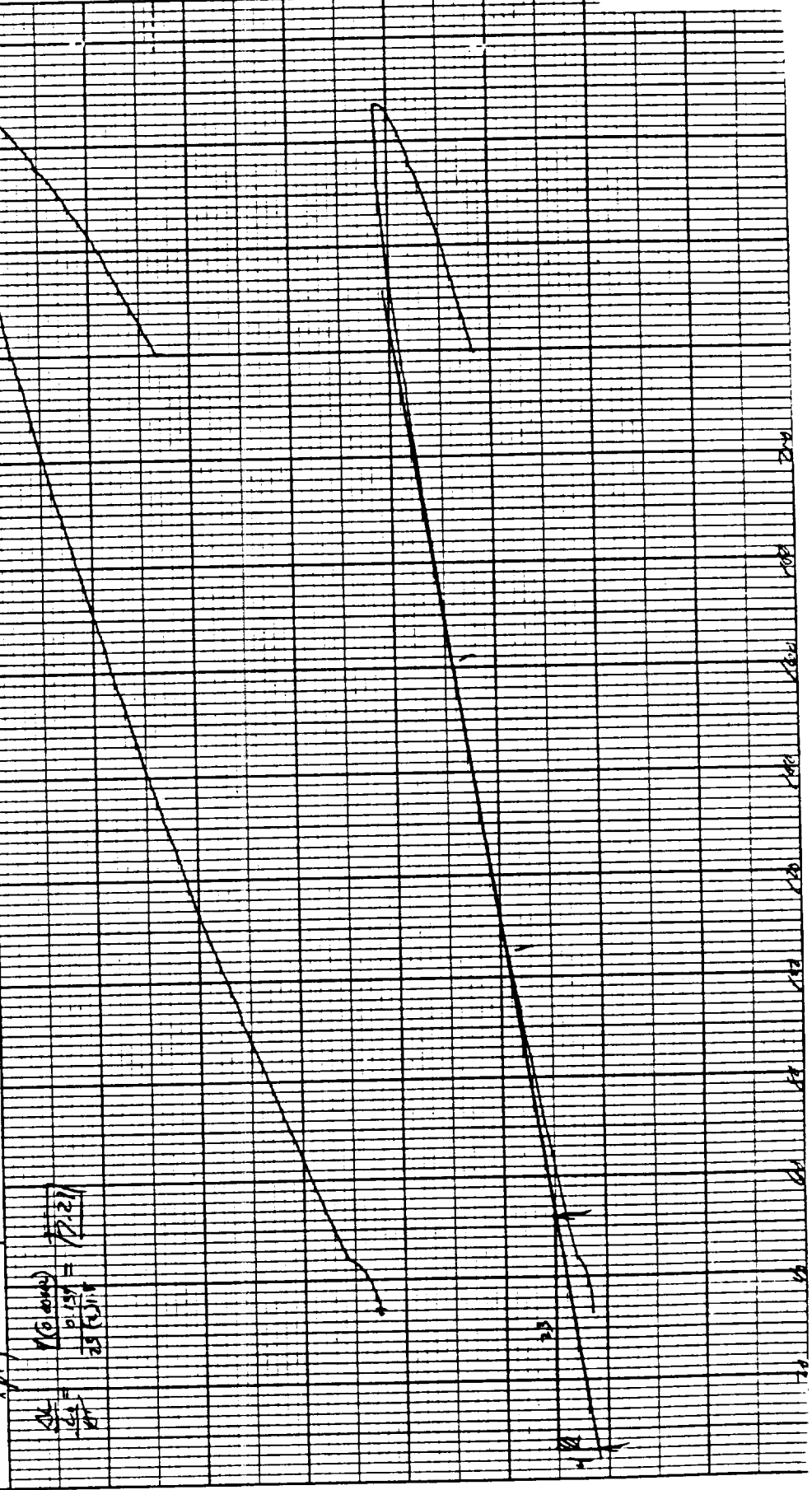
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PART NO. 990088

RUN NO. _____ DATE <u>11/3/60</u> OPERATOR <u>PL</u> SAMPLE <u>205280-1-3945-3</u> ATM. <u>42</u> @ <u>500</u> FLOW RATE <u>3.53 cc/h</u>	<b>T-AXIS</b> SCALE, °C/in. <u>30-20</u> PROG RATE, °C/min <u>10</u> HEAT / COOL <u>ISO</u> SHIFT, in. <u>0</u>	<b>DTA-DSC</b> SCALE, °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	<b>TGA</b> SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	<b>TMA (um/in)</b> SCALE, mils/in. <u>0.10.2</u> MODE <u>Exhausted</u> SAMPLE SIZE <u>0.14</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in. _____
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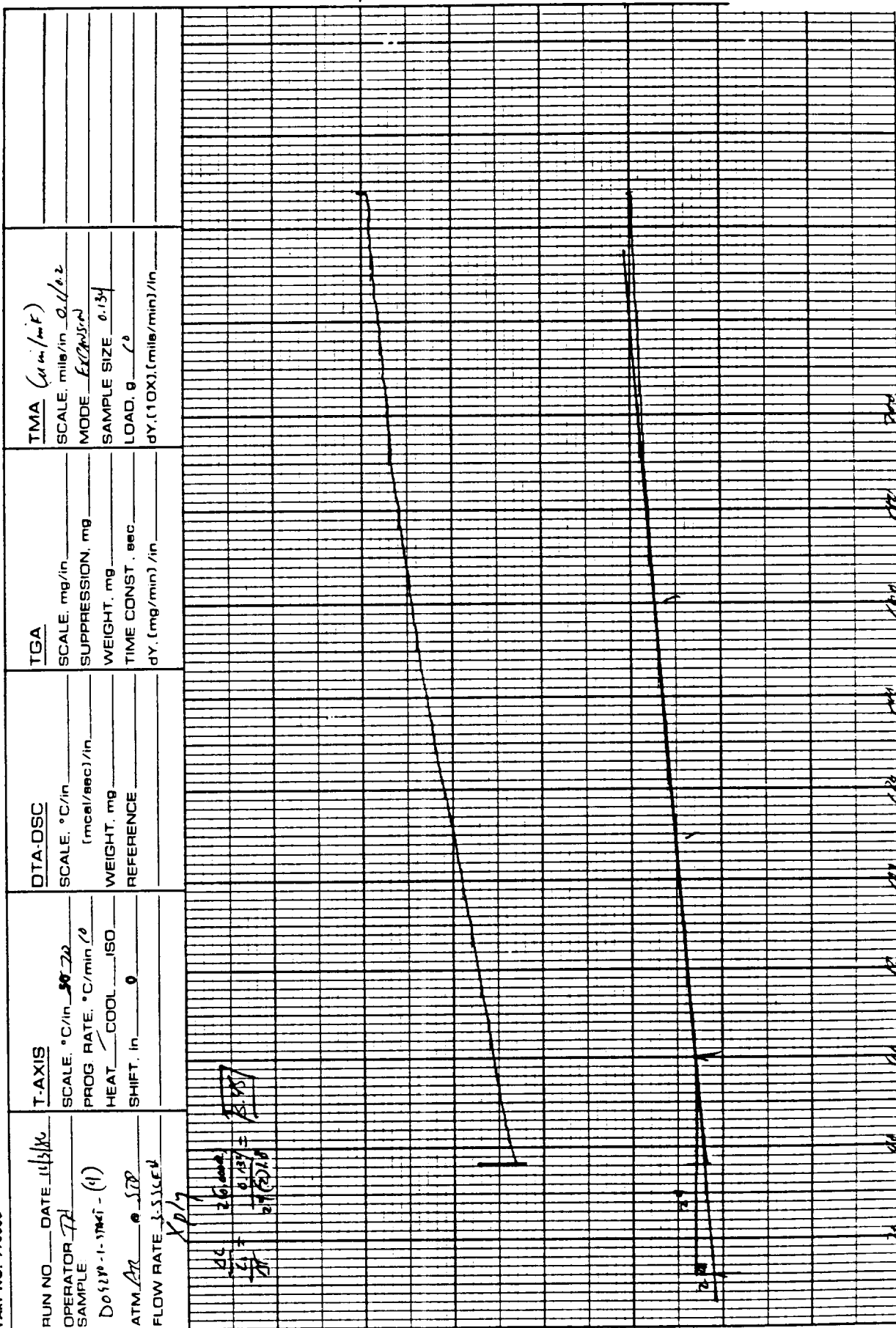


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PART NO. 990088



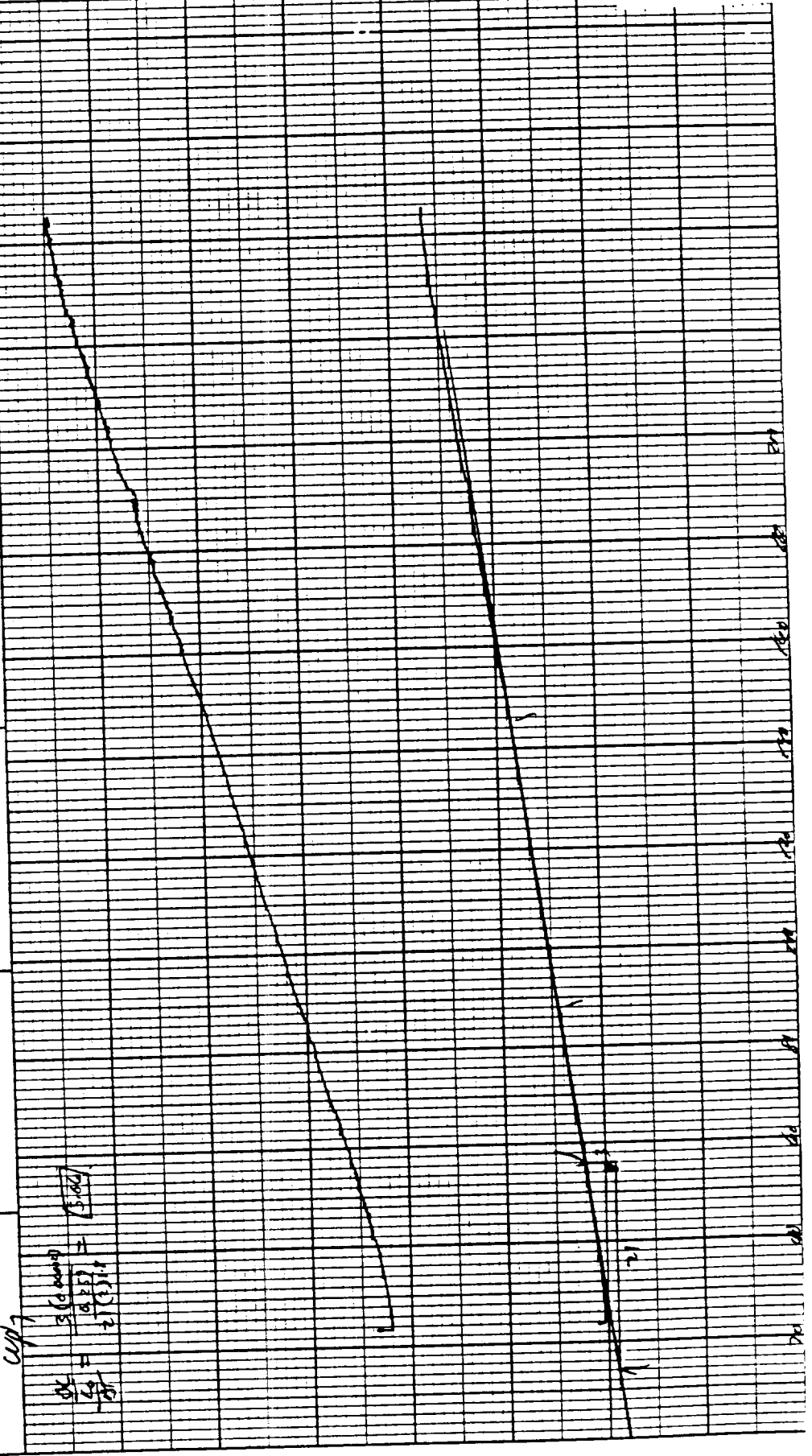
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PART NO. 990088

RUN NO. <u>1411</u> OPERATOR <u>DA</u> SAMPLE <u>D 01310-1-150-1</u> ATM <u>DA</u> @ <u>500</u> FLOW RATE <u>2-5340</u>	<b>T-AXIS</b> SCALE, °C/in. <u>20</u> PROG RATE, °C/min <u>0</u> HEAT <u>COOL</u> ISO SHIFT, in. <u>0</u>	<b>DTA-DSC</b> SCALE, °C/in. <u>(mg/sec)/in</u> WEIGHT, mg REFERENCE	<b>TGA</b> SCALE, mg/in. SUPPRESSION, mg WEIGHT, mg TIME CONST, sec dY, (mg/min) /in	<b>TMA</b> (μm/min) SCALE, mile/in. <u>0.1/0.2</u> MODE <u>60 (200) 1.0</u> SAMPLE SIZE <u>0.251</u> LOAD, g <u>10</u> dY, (10X) (mile/min) /in
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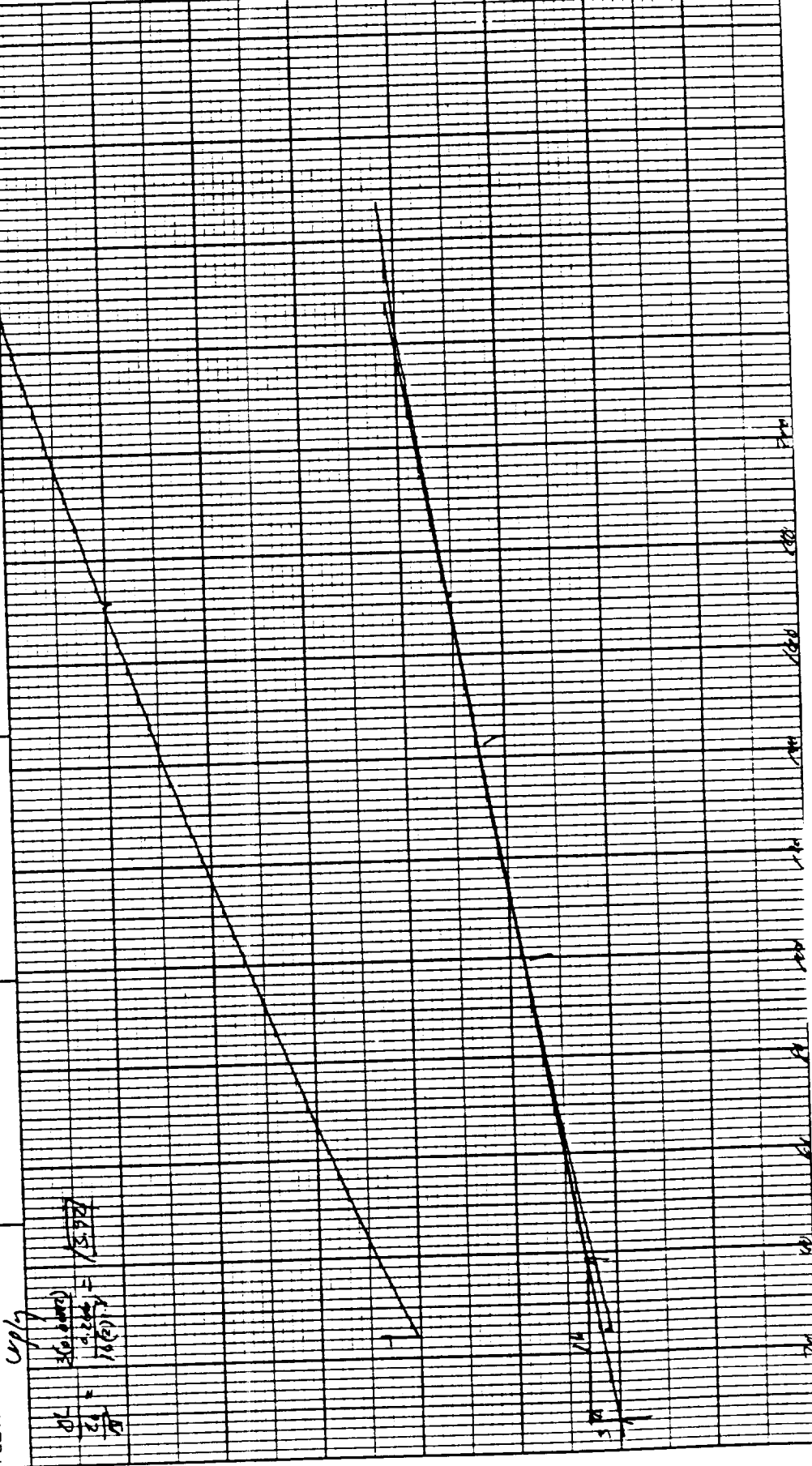
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PART NO. 990088

RUN NO. <u>DATE</u> <u>dl/16</u> OPERATOR <u>DL</u> SAMPLE <u>DO 220-1-10-2</u> ATM <u>DL</u> <u>0.22</u> FLOW RATE <u>3-53</u> <u>cm</u>	<b>T-AXIS</b> SCALE: °C/in <u>50</u> <u>20</u> PROG RATE: °C/min <u>10</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT: in <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in <u>          </u> (mcal/sec)/in <u>          </u> WEIGHT: mg <u>          </u> REFERENCE <u>          </u>	<b>TGA</b> SCALE: mg/in <u>          </u> SUPPRESSION: mg <u>          </u> WEIGHT: mg <u>          </u> TIME CONST.: sec <u>          </u> dY: (mg/min)/in <u>          </u>	<b>TMA</b> (mi./in) SCALE: mi/in <u>0.1/6.2</u> MODE <u>EXHAUST</u> SAMPLE SIZE <u>0.24</u> LOAD: g <u>0</u> dY: (10X) (mi/min)/in <u>          </u>
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PART NO. 990088

RUN NO. 1144  
 OPERATOR DP  
 SAMPLE DO570-1-4m-(3)  
 ATM 22 @ 577  
 FLOW RATE 3-55 (L)

T-AXIS  
 SCALE: °C/in 50 20  
 PROG. RATE: °C/min 0  
 HEAT / COOL ISO  
 SHIFT: in 0

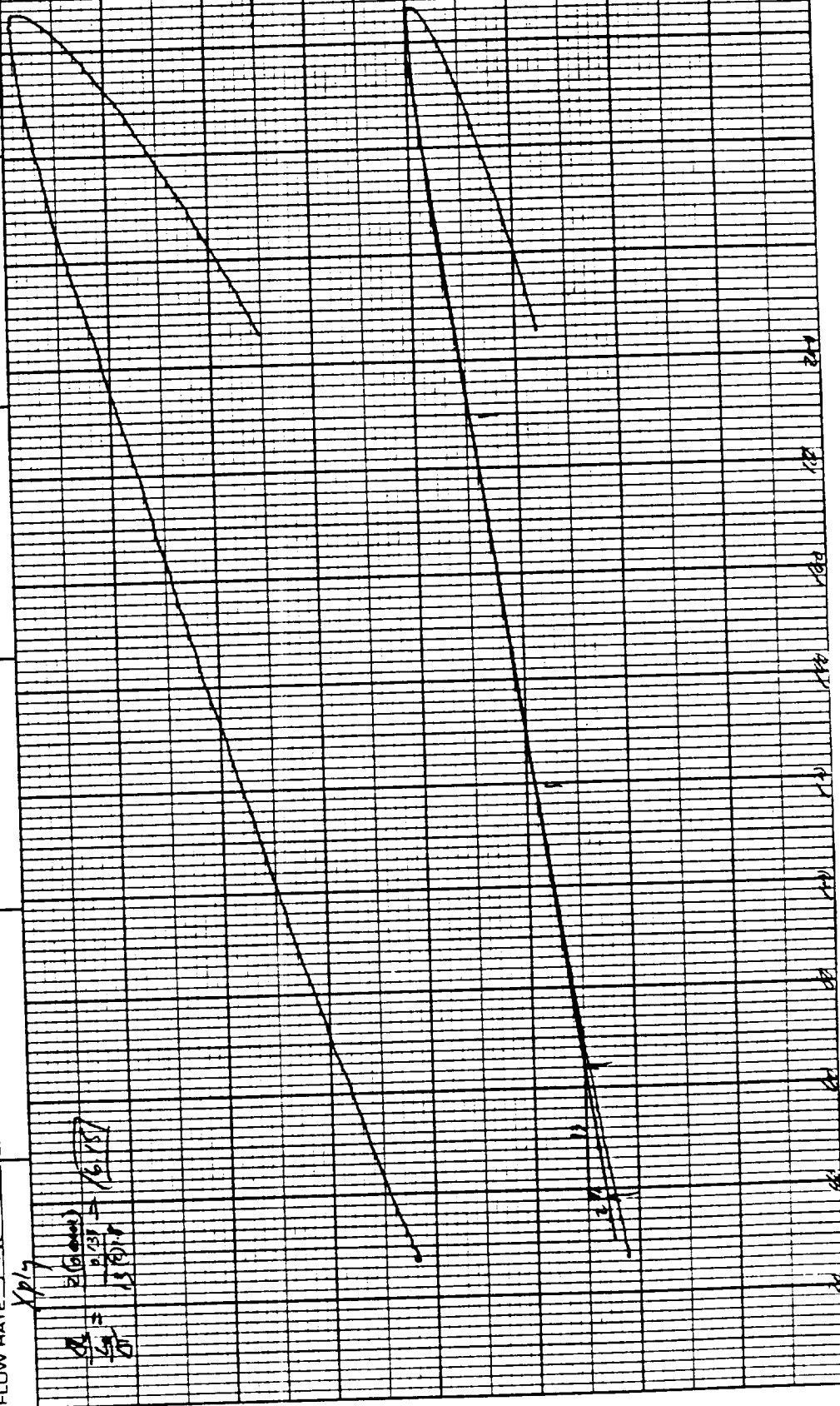
DTA-DSC  
 SCALE: °C/in  
 (mcal/sec)/in  
 WEIGHT: mg  
 REFERENCE

TGA

SCALE: mg/in  
 SUPPRESSION: mg  
 WEIGHT: mg  
 TIME CONST.: sec  
 dY: (mg/min)/in

TMA

SCALE: 40 (in/in)  
 SCALE: mile/in 0.162  
 MODE EXTR  
 SAMPLE SIZE 0.39  
 LOAD: g 1  
 dY: (10X) (mile/min)/in

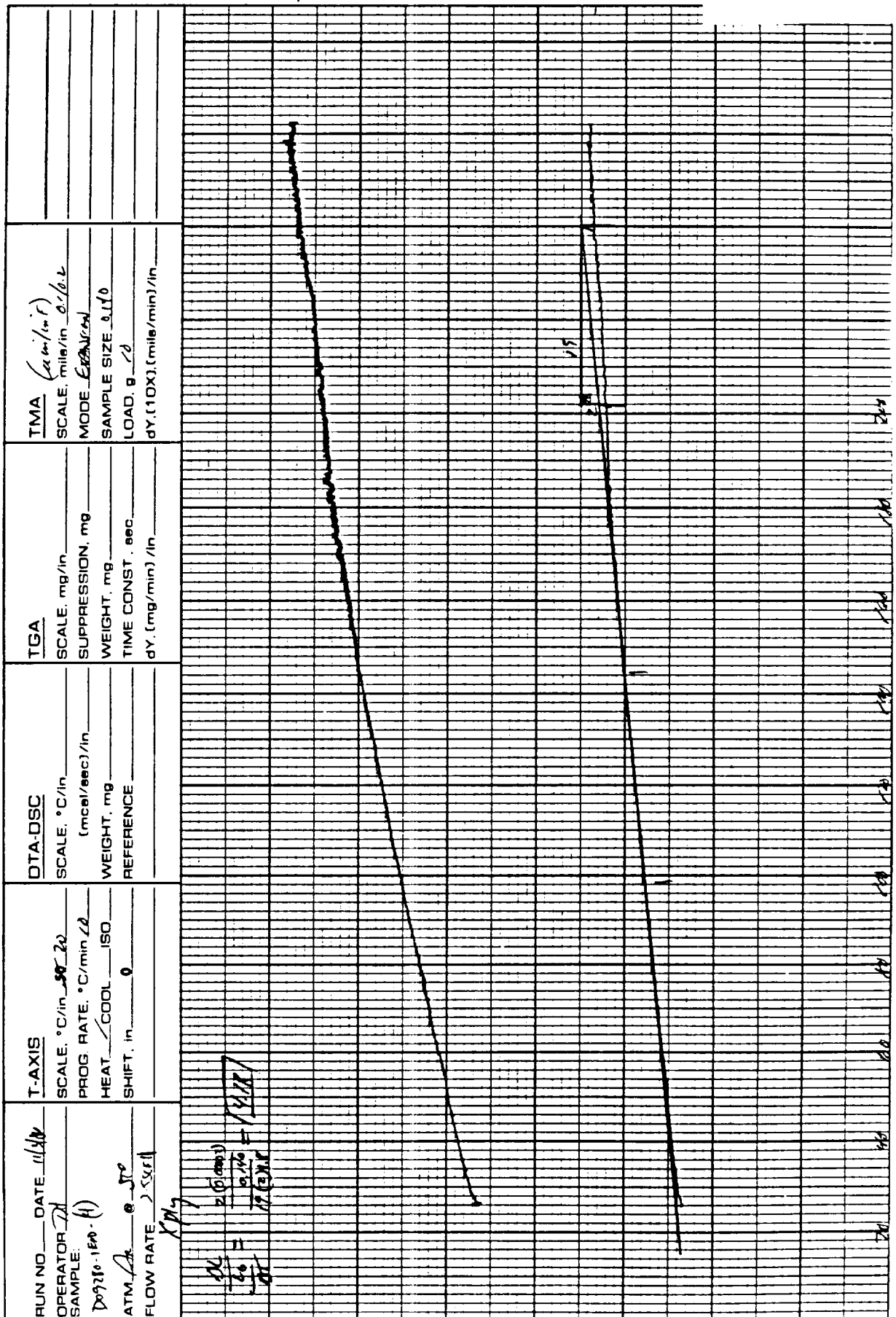


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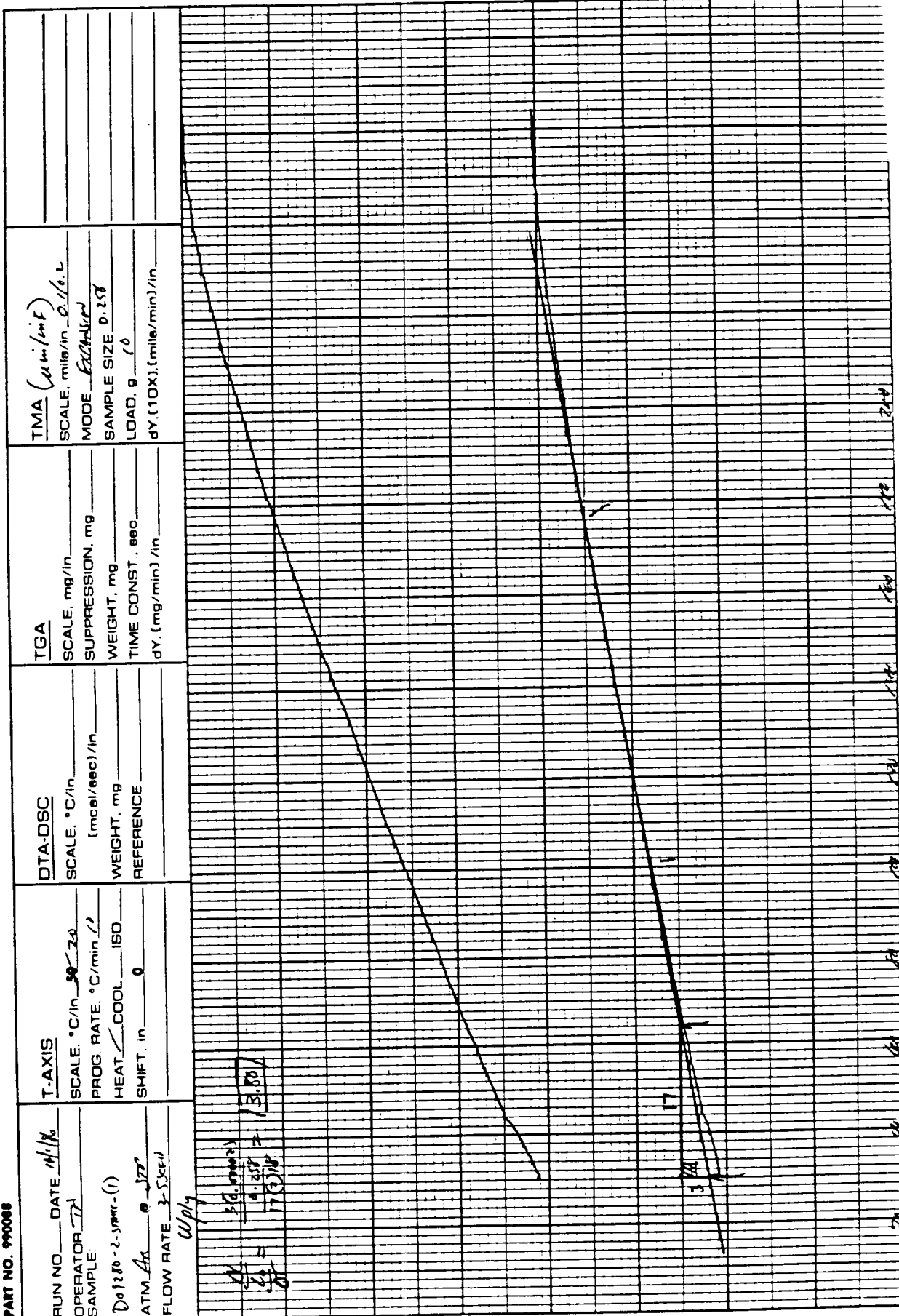
PART NO. 990088



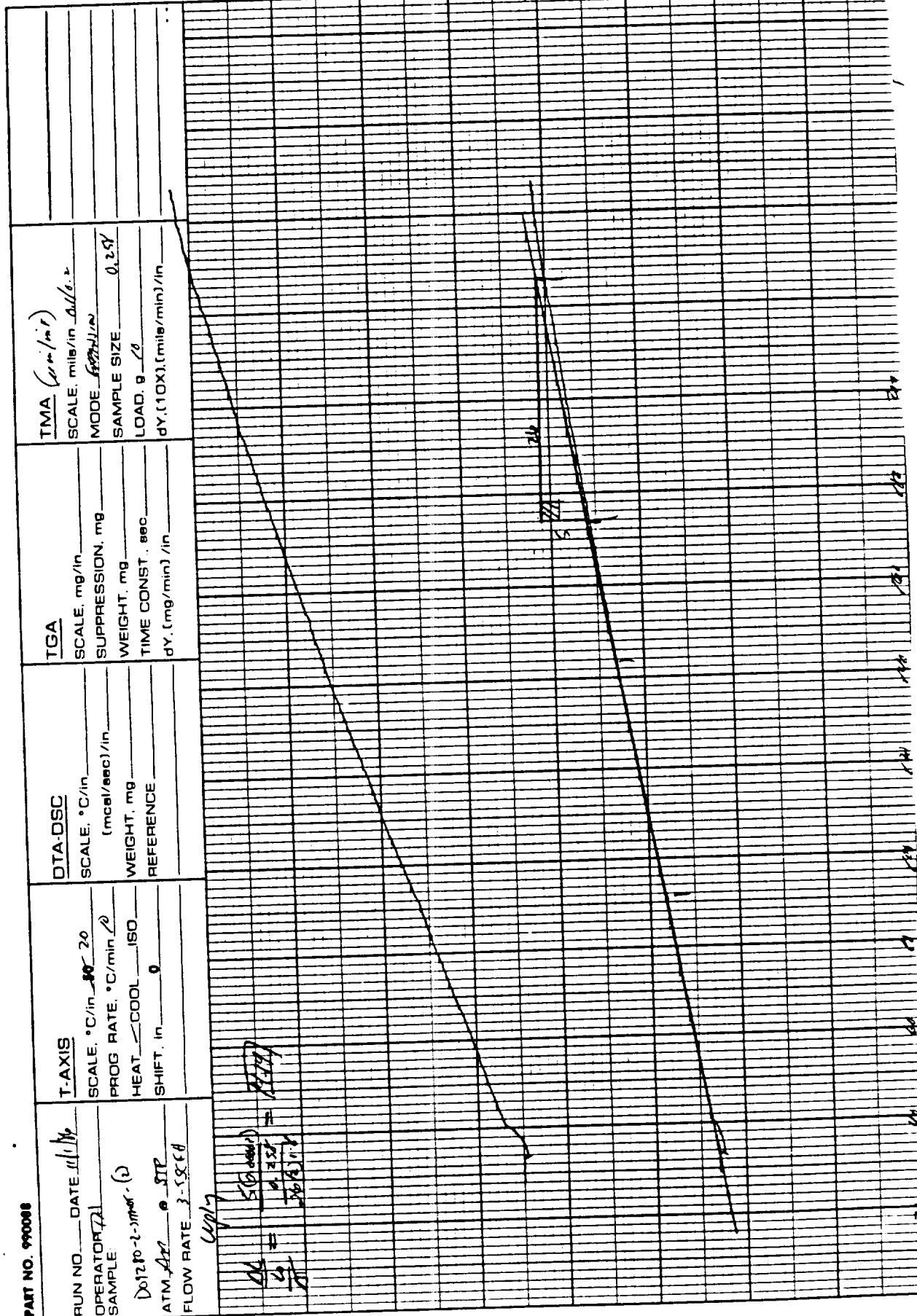
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PART NO. 990088



PART NO. 990088

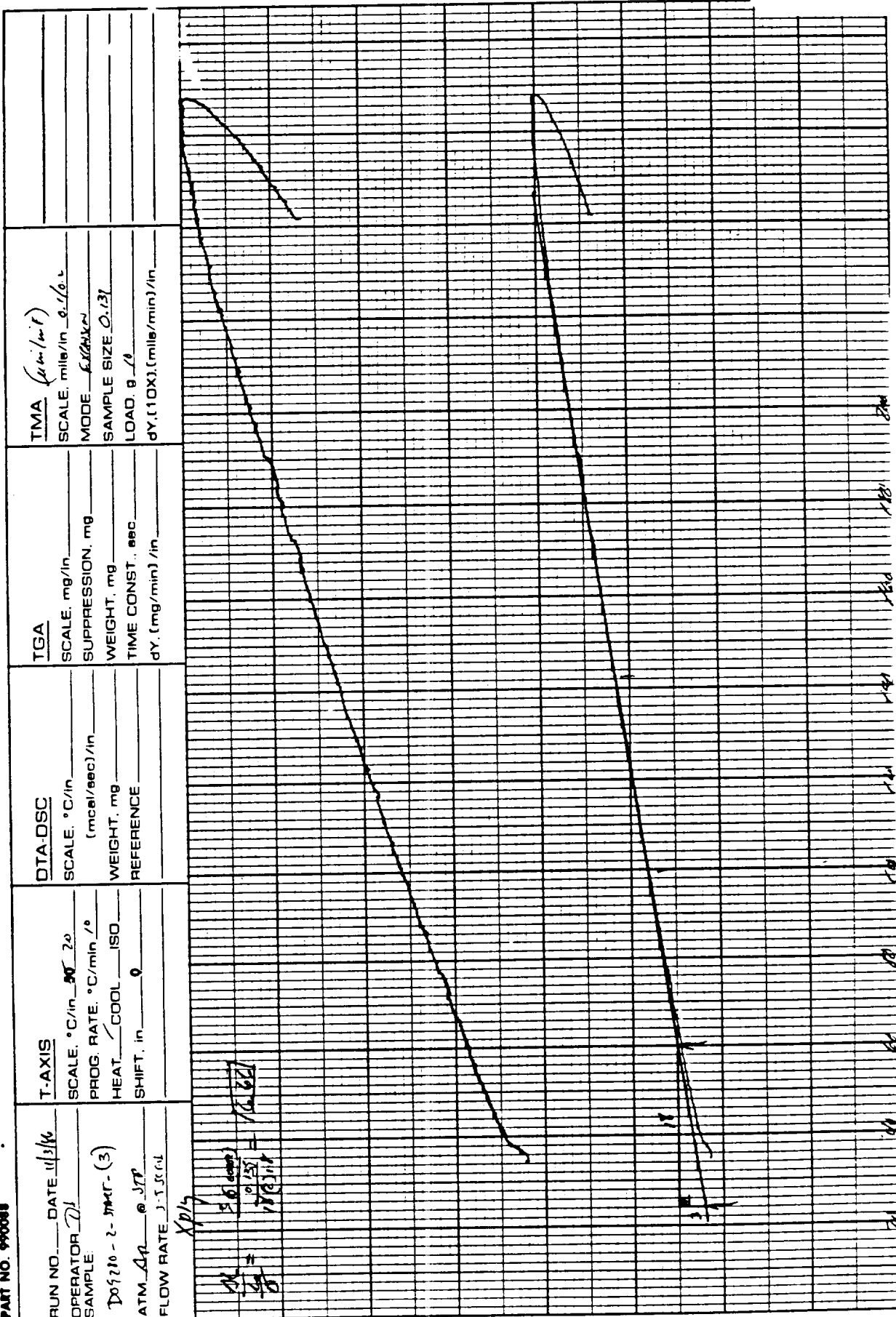


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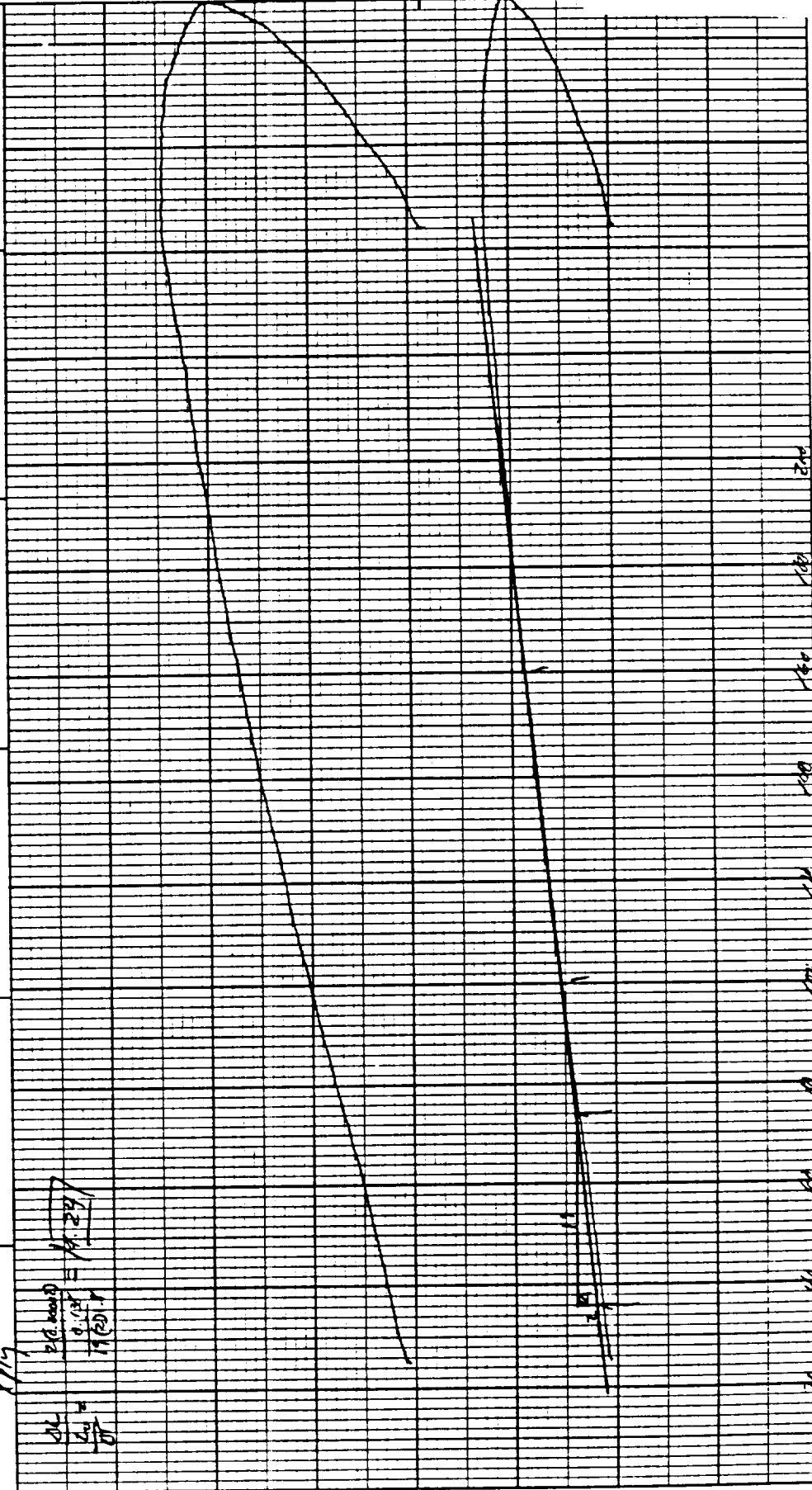
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PART NO. 990088

RUN NO. _____ OPERATOR <u>DT</u> SAMPLE <u>DOS 281-1-SMART-(4)</u> ATMAL <u>0.578</u> FLOW RATE <u>3.584</u>	T-AXIS SCALE, °C/in <u>50/20</u> PROG RATE, °C/min <u>10</u> HEAT <u>COOL</u> ISO SHIFT, in <u>0</u>	DTA/DSC SCALE, °C/in _____ (mcal/sec)/in _____ WEIGHT, mg _____ REFERENCE _____	TGA SCALE, mg/in _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST, sec _____ dY, (mg/min)/in _____	TMA (μin/in°F) SCALE, mils/in <u>0.1/0.2</u> MODE <u>EXTRUSION</u> SAMPLE SIZE <u>0.137</u> LOAD, g <u>10</u> dY, (10X)(mils/min)/in _____
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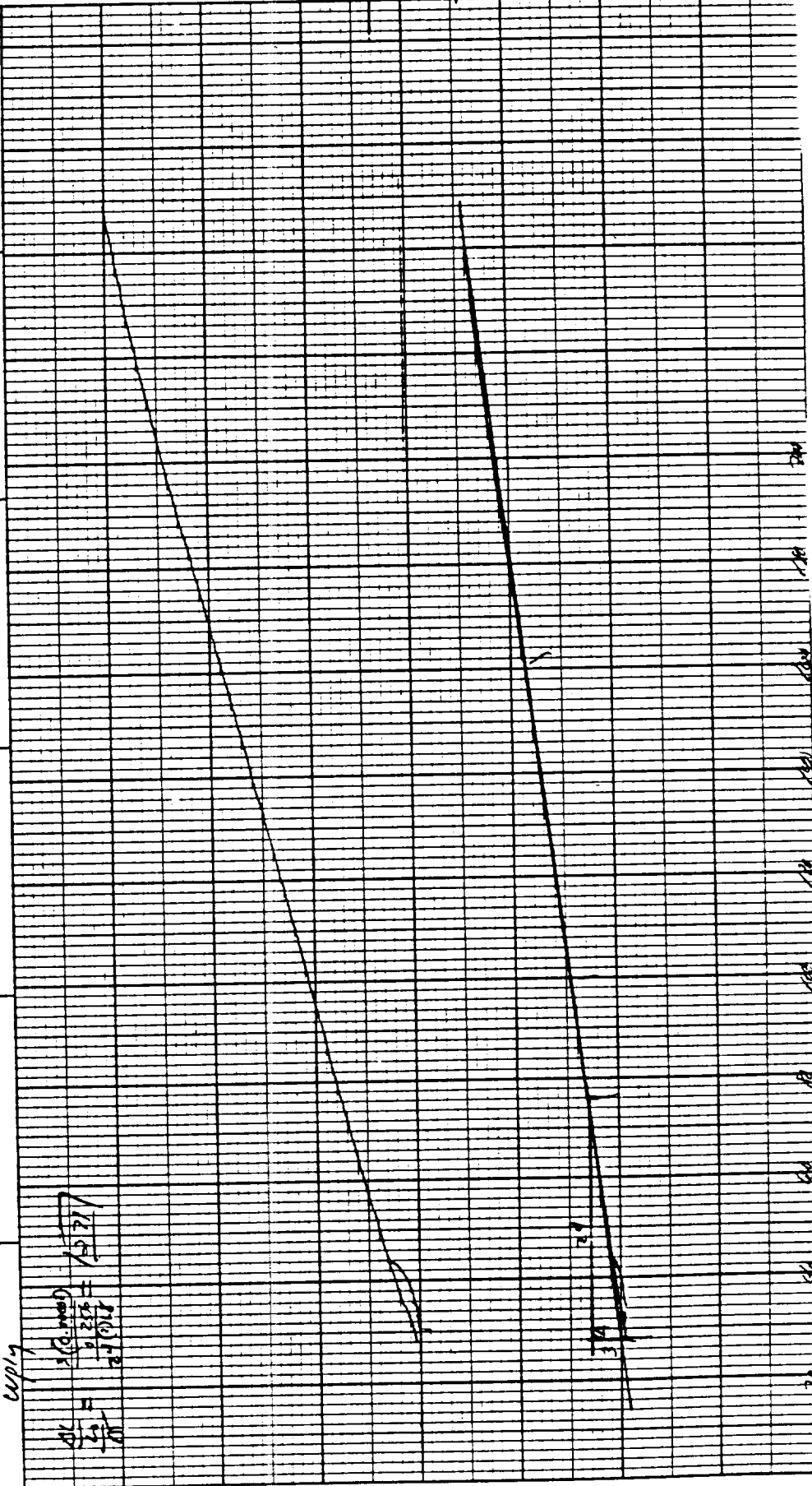
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PART NO. 990088

RUN NO. _____ OPERATOR <u>DP</u> SAMPLE <u>D012 P0-2.5m (1)</u> ATM. <u>44</u> °C FLOW RATE <u>1.55 L/min</u>	<b>T-AXIS</b> SCALE: °C/in. <u>30/20</u> PROG. RATE: °C/min <u>0</u> HEAT <u>✓</u> COOL <u>  </u> ISO <u>  </u> SHIFT: in. <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	<b>TGA</b> SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	<b>TMA</b> (µin/min) SCALE, mils/in. <u>0.1/0.2</u> MODE <u>0.001/0.002</u> SAMPLE SIZE <u>0.154</u> LOAD, g <u>0.0</u> dY, (10X), (mils/min)/in. _____
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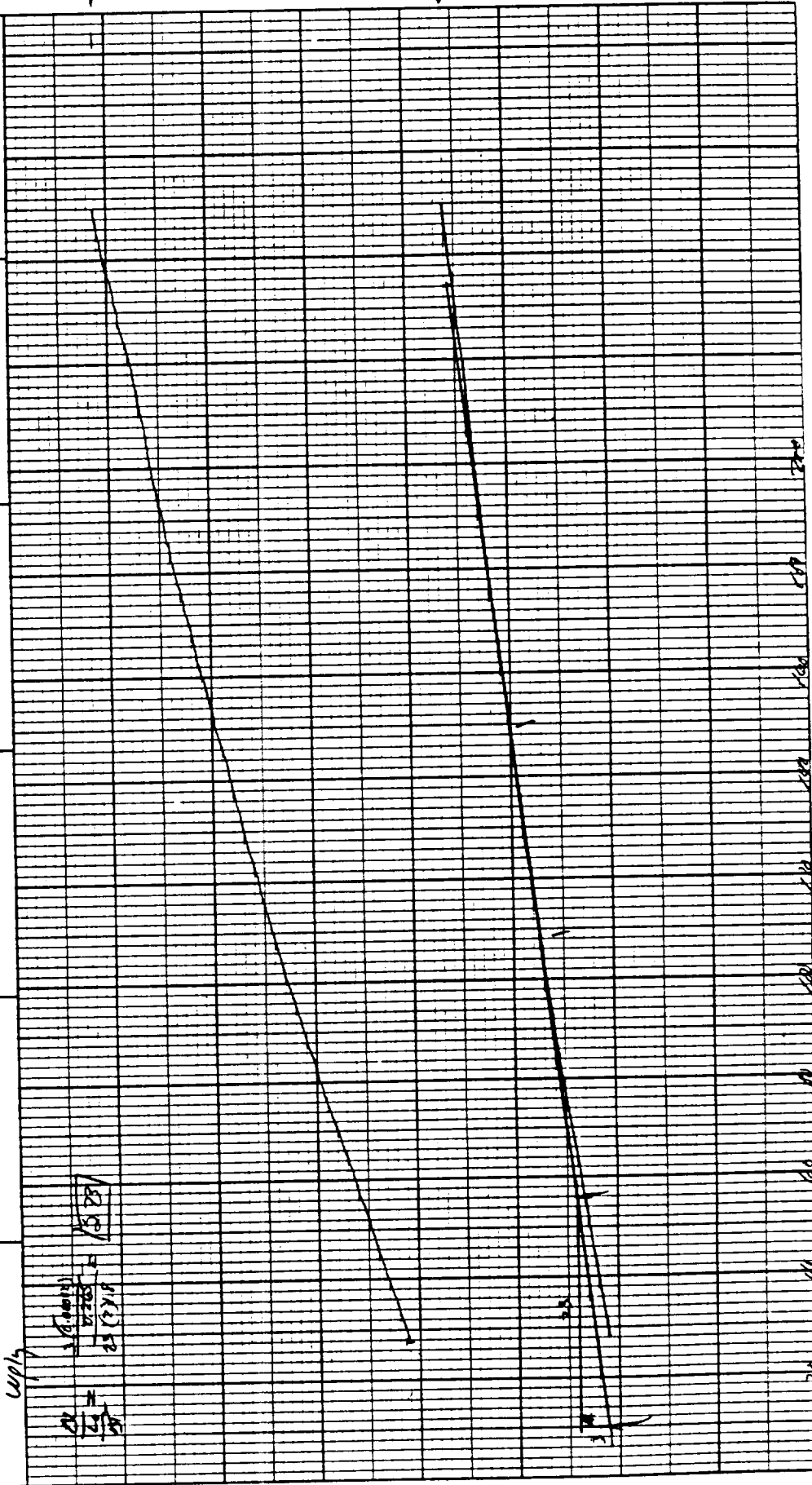
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PART NO. 990088

RUN NO. <u>11170</u> OPERATOR <u>AN</u> SAMPLE <u>D920-2-EPH-(2)</u> ATM. <u>Cal</u> @ <u>3MP</u> FLOW RATE <u>3-5 (L/H)</u>	<b>T-AXIS</b> SCALE: °C/in <u>20</u> PROG. RATE: °C/min <u>0</u> HEAT <u>✓</u> COOL <u>ISO</u> SHIFT, in <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in <u>(mcal/sec)/in</u> WEIGHT, mg <u>REFERENCE</u>	<b>TGA</b> SCALE, mg/in <u>—</u> SUPPRESSION, mg <u>—</u> WEIGHT, mg <u>—</u> TIME CONST., sec <u>—</u> dY, (mg/min)/in <u>—</u>	<b>TMA</b> <u>(μm/in)</u> SCALE, mils/in <u>0.1/0.2</u> MODE <u>Constant</u> SAMPLE SIZE <u>Δ 165</u> LOAD, g <u>10</u> dY, (10X) (mils/min)/in <u>—</u>
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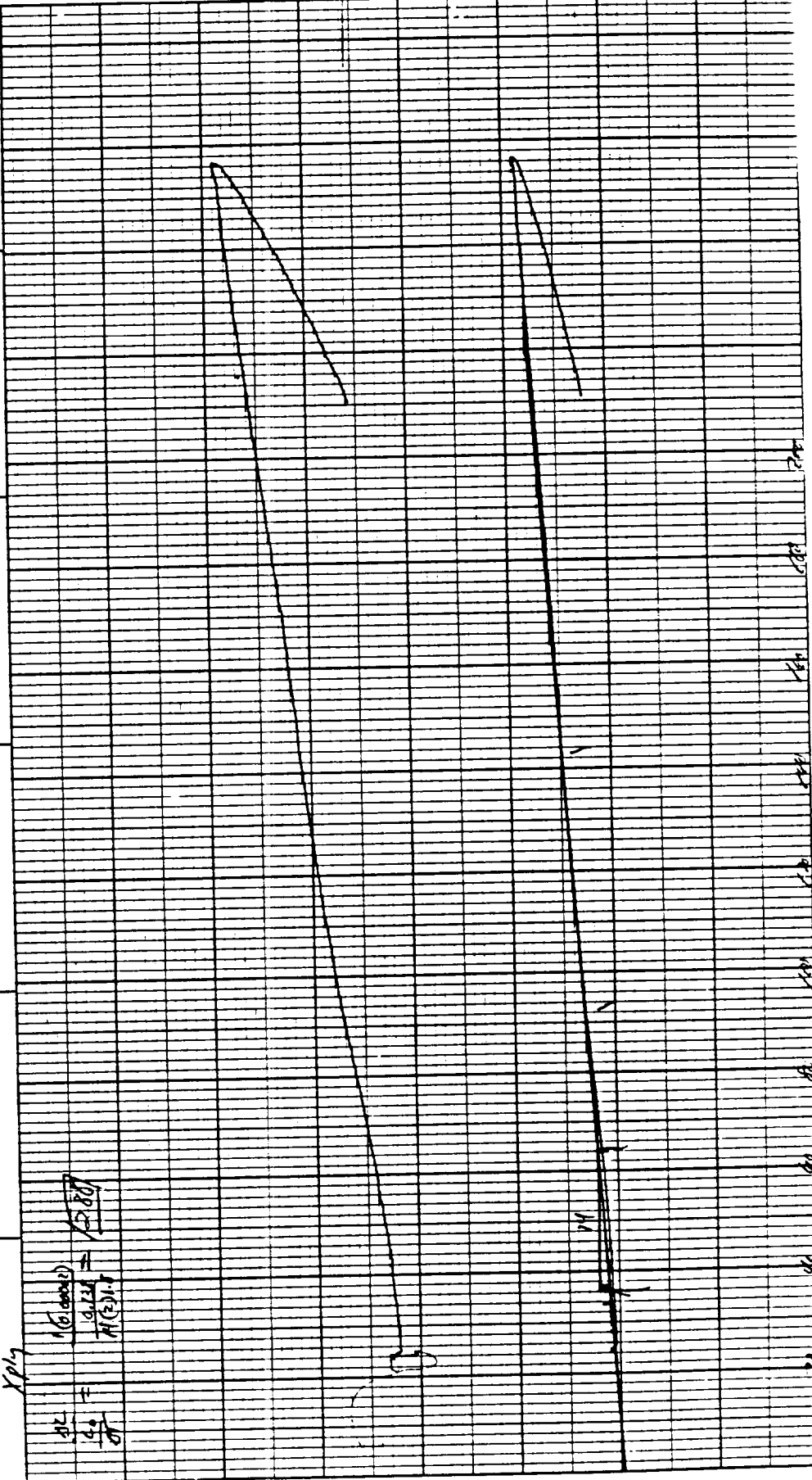
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PART NO. 990088

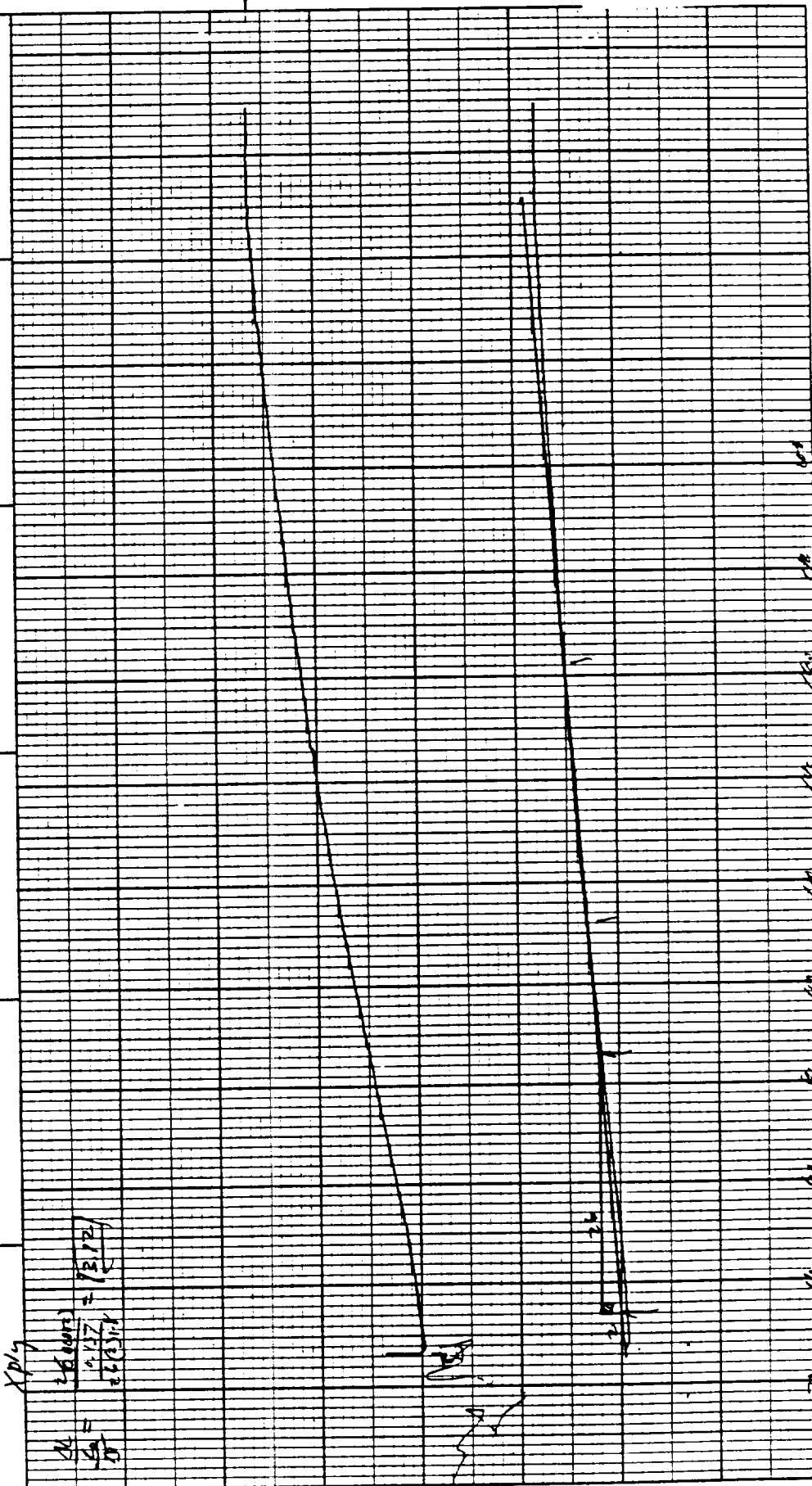
RUN NO. <u>DATE 11/1/86</u> OPERATOR <u>TH</u> SAMPLE <u>De 9280-2 (50) (3)</u> ATM <u>100</u> @ <u>SPD</u> FLOW RATE <u>2-CLCET</u>		T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min <u>10</u> HEAT <u>✓</u> COOL <u>ISO</u> SHIFT, in. <u>0</u>		DTA-DSC SCALE, °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____		TGA SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST. sec _____ dY, (mg/min)/in. _____		TMA (in./in.°C) SCALE, mils/in. <u>0.1/0.2</u> MODE <u>Exponential</u> SAMPLE SIZE <u>0.138</u> LOAD, g <u>11</u> dY, (10X), (mils/min)/in. _____	
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PART NO. 990088

RUN NO. <u>1116</u> OPERATOR <u>DL</u> SAMPLE <u>D09211-2-600-(4)</u> ATM <u>21</u> @ <u>572</u> FLOW RATE <u>3-5X41</u>	<b>T-AXIS</b> (C/min/F) SCALE: °C/in <u>50-20</u> PROG RATE: °C/min <u>2</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT: in <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in <u>          </u> (mcal/sec)/in <u>          </u> WEIGHT: mg <u>          </u> REFERENCE <u>          </u>	<b>TGA</b> SCALE: mg/in <u>          </u> SUPPRESSION: mg <u>          </u> WEIGHT: mg <u>          </u> TIME CONST.: sec <u>          </u> dY: (mg/min)/in <u>          </u>	<b>TMA</b> (C/min/in/F) SCALE: mile/in <u>0.1/0.2</u> MODE <u>EXHAUST</u> SAMPLE SIZE <u>0.137</u> LOAD: g <u>10</u> dY: (10X) (mile/min)/in <u>          </u>
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$$\frac{A_1}{A_2} = \frac{26.0001}{0.137} = 190.512$$



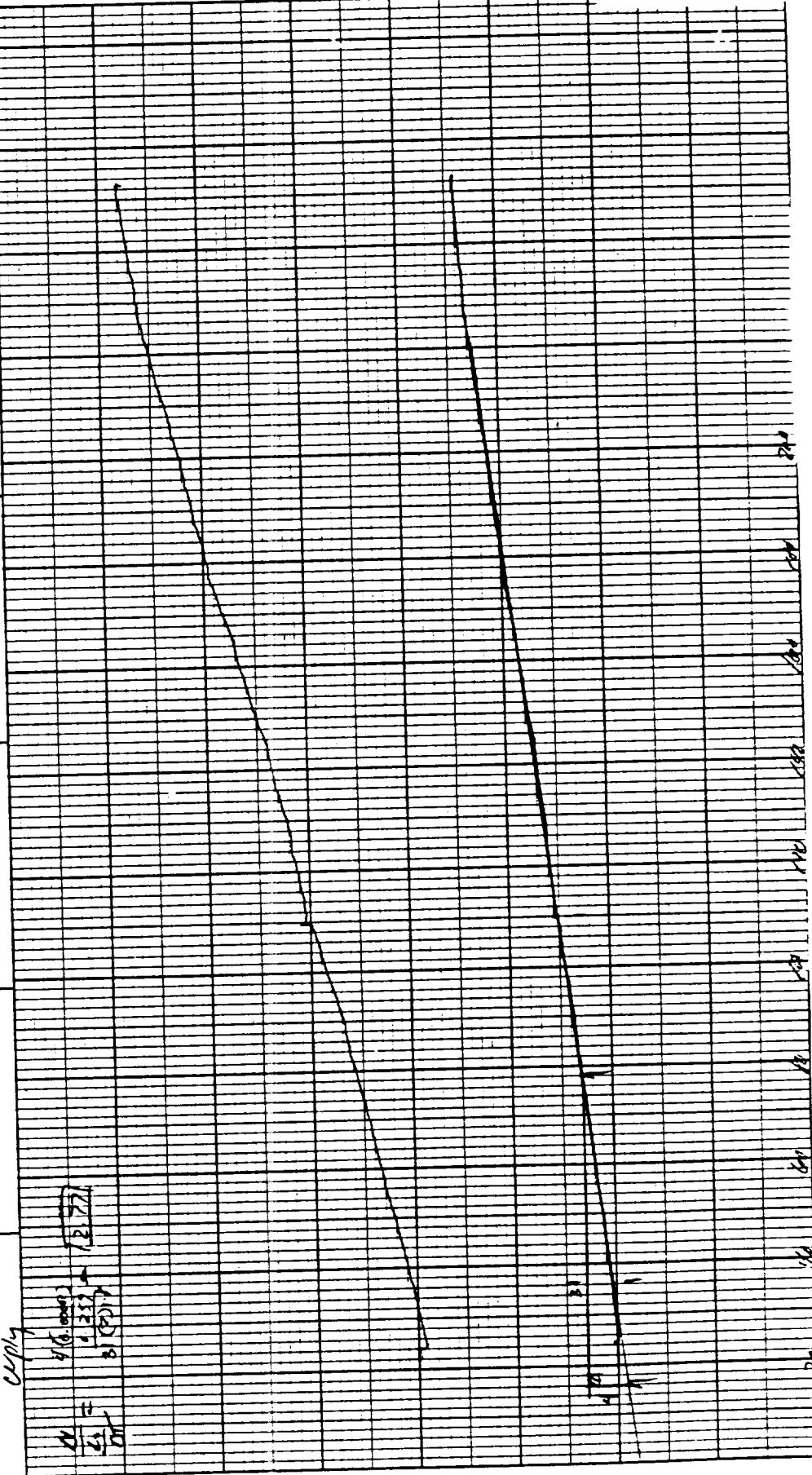
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PART NO. 990088

RUN NO. _____ OPERATOR <u>TR</u> SAMPLE: <u>105 205-3-5000-11</u> ATM <u>40</u> @ <u>500</u> FLOW RATE <u>3-5000</u>	<b>T-AXIS</b> SCALE: °C/in <u>50</u> <u>20</u> PROG. RATE: °C/min <u>0</u> HEAT <u>COOL</u> ISO SHIFT: in <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in _____ (mcal/sec)/in _____ WEIGHT: mg _____ REFERENCE _____	<b>TGA</b> SCALE: mg/in _____ SUPPRESSION: mg _____ WEIGHT: mg _____ TIME CONST.: sec _____ dY (10X) (mils/min) /in _____	<b>TMA</b> (mm/min) SCALE: mils/in <u>0.1/0.2</u> MODE <u>EXTENSION</u> SAMPLE SIZE <u>0.159</u> LOAD: g <u>10</u> dY (10X) (mils/min) /in _____
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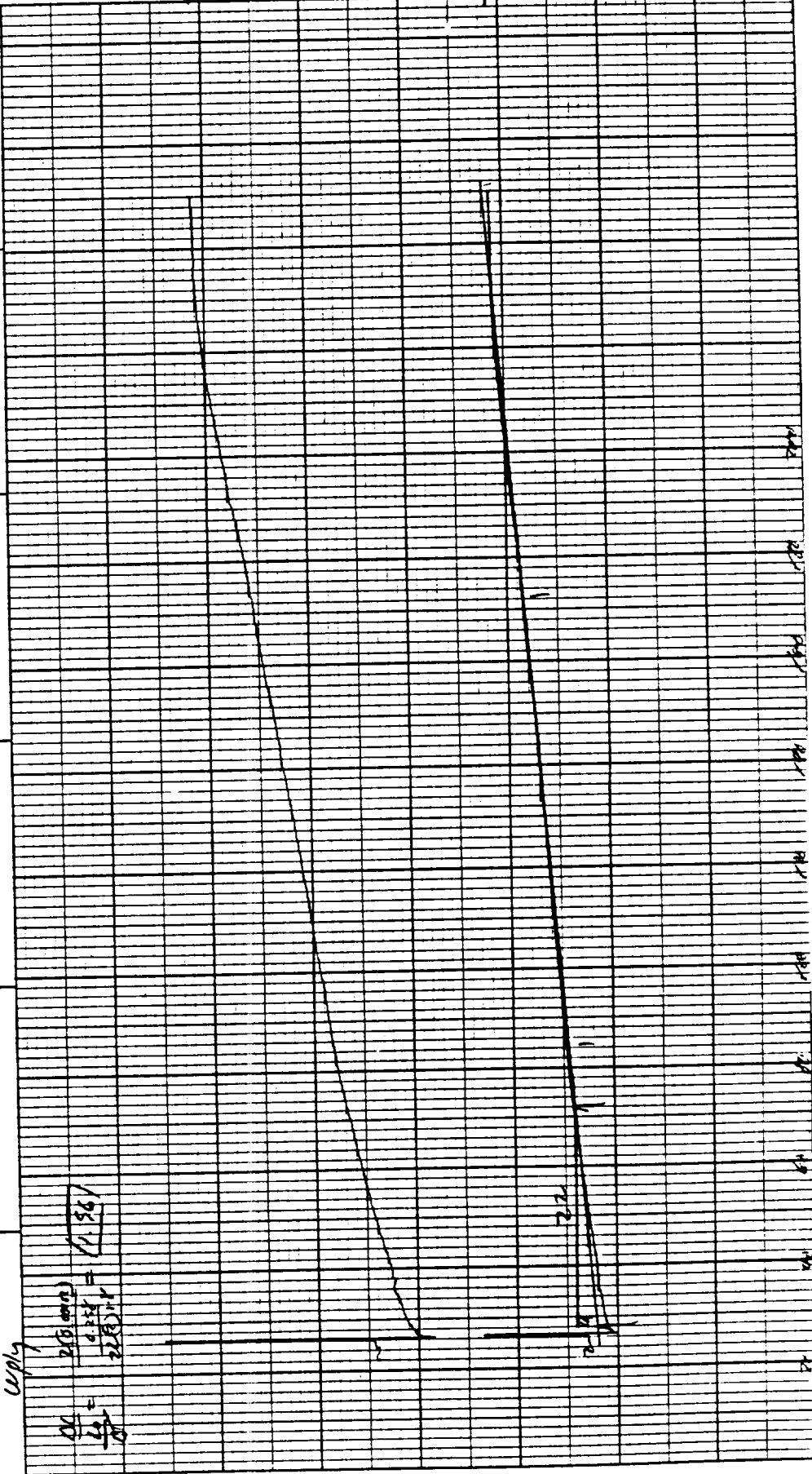
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PART NO. 990088

RUN NO. _____	DATE <u>11/1/76</u>	T-AXIS	DTA-DSC	TGA	TMA
OPERATOR <u>TL</u>	SCALE: °C/in. <u>20</u>	SCALE: °C/in. _____	SCALE: mg/in. _____	SCALE: mg/in. <u>0.1/0.2</u>	SCALE: mils/in. <u>0.1/0.2</u>
SAMPLE <u>76510-305mnd (1)</u>	PROG. RATE: °C/min <u>10</u>	(mcal/sec)/in. _____	SUPPRESSION, mg _____	MODE <u>Exhaustive</u>	MODE <u>Exhaustive</u>
<u>76510-305mnd (1)</u>	HEAT <u>COOL</u> ISO	WEIGHT, mg _____	WEIGHT, mg _____	SAMPLE SIZE <u>0.25g</u>	SAMPLE SIZE <u>0.25g</u>
ATM <u>4in @ STD</u>	SHIFT, in <u>0</u>	REFERENCE _____	TIME CONST., sec _____	LOAD, g <u>10</u>	LOAD, g <u>10</u>
FLOW RATE <u>3-5 cfm</u>			dY (mg/min)/in. _____	dY (10X) (mils/min)/in. _____	dY (10X) (mils/min)/in. _____

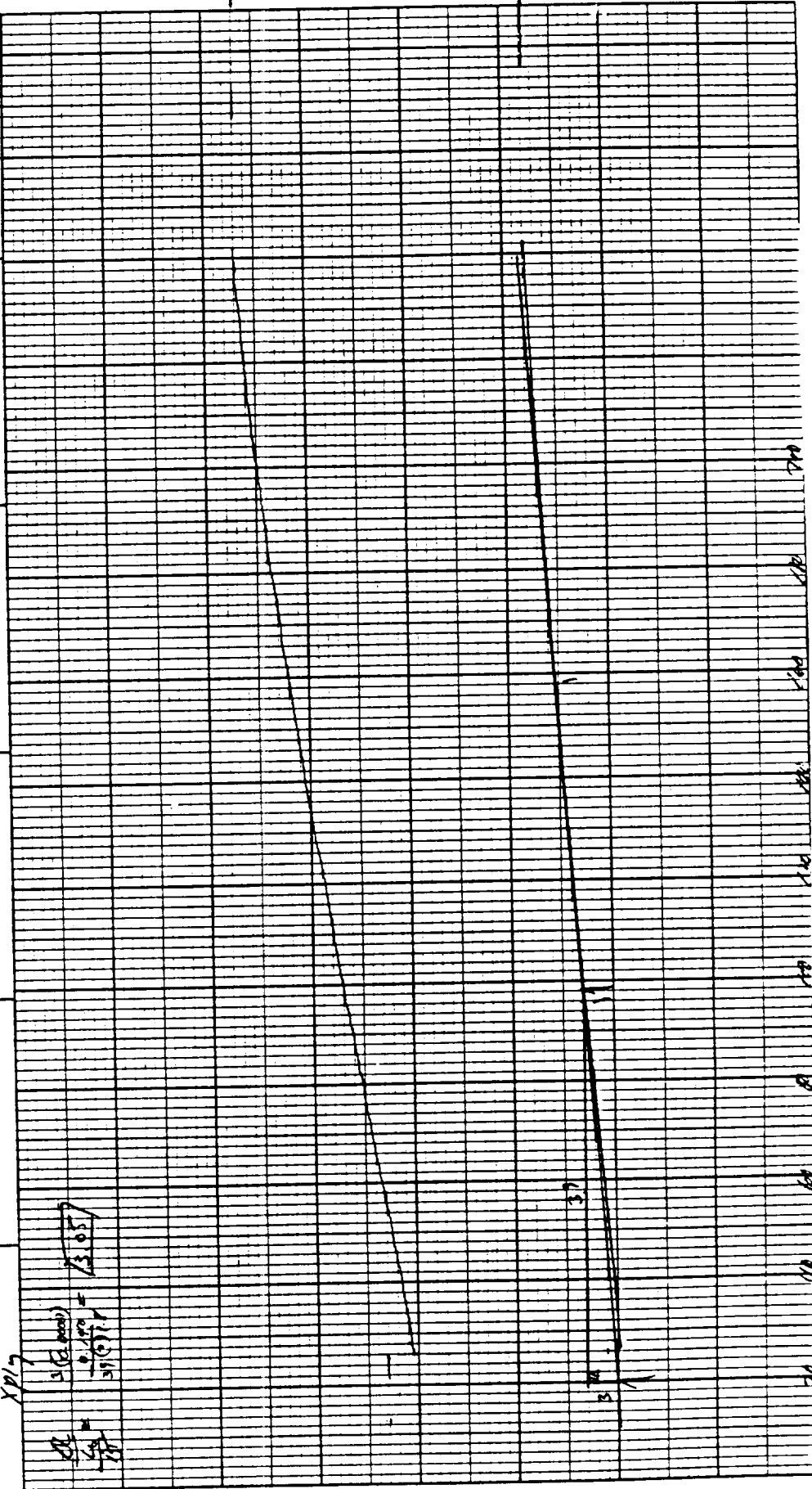


DU PONT Instruments

MEASURED VARIABLE  
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OF POOR QUALITY

PART NO. 990088

RUN NO. <u>      </u> DATE <u>11/1/90</u> OPERATOR <u>TH</u> SAMPLE <u>D09210-3-5000 (5)</u> ATM <u>A1</u> @ <u>570</u> FLOW RATE <u>2.5 L/min</u>	<b>T-AXIS</b> SCALE, °C/in. <u>20</u> PROG. RATE, °C/min <u>0</u> HEAT / COOL <u>ISO</u> SHIFT, in. <u>0</u>	<b>DTA-DSC</b> SCALE, °C/in. <u>      </u> (mcal/sec)/in. <u>      </u> WEIGHT, mg <u>      </u> REFERENCE <u>      </u>	<b>TGA</b> SCALE, mg/in. <u>      </u> SUPPRESSION, mg <u>      </u> WEIGHT, mg <u>      </u> TIME CONST., sec <u>      </u> dY, (mg/min)/in. <u>      </u>	<b>TMA</b> (µm/in.) SCALE, mile/in. <u>0.1/100</u> MODE <u>Auto</u> SAMPLE SIZE <u>0.40</u> LOAD, g <u>0</u> dY, (10X) (mile/min)/in. <u>      </u>
--	--	--	--	--





PART NO. 990068

RUN NO. DATE 1/2/72

OPERATOR D

SAMPLE Do 210 - 3 - 1mm (4)

ATM. 42 @ 50

FLOW RATE 3-55 cc

## T-AXIS

SCALE: °C/in 50 20

PROG. RATE: °C/min 10

HEAT / COOL ISO

SHIFT, in 0

## DTA-DSC

SCALE: °C/in

(mcal/sec)/in

WEIGHT, mg

REFERENCE

## TGA

SCALE, mg/in

SUPPRESSION, mg

WEIGHT, mg

TIME CONST., sec

dY, (mg/min)/in

## TMA

SCALE, mils/in 0.1/100

MODE Ex 2000

SAMPLE SIZE 0.141

LOAD, g 1

dY, (10X), (mils/min)/in

$$\frac{dL}{dt} = \frac{2.6 \text{ (mils/min)}}{1.0 \text{ (min)}} = 2.6 \text{ (mils/min)}$$

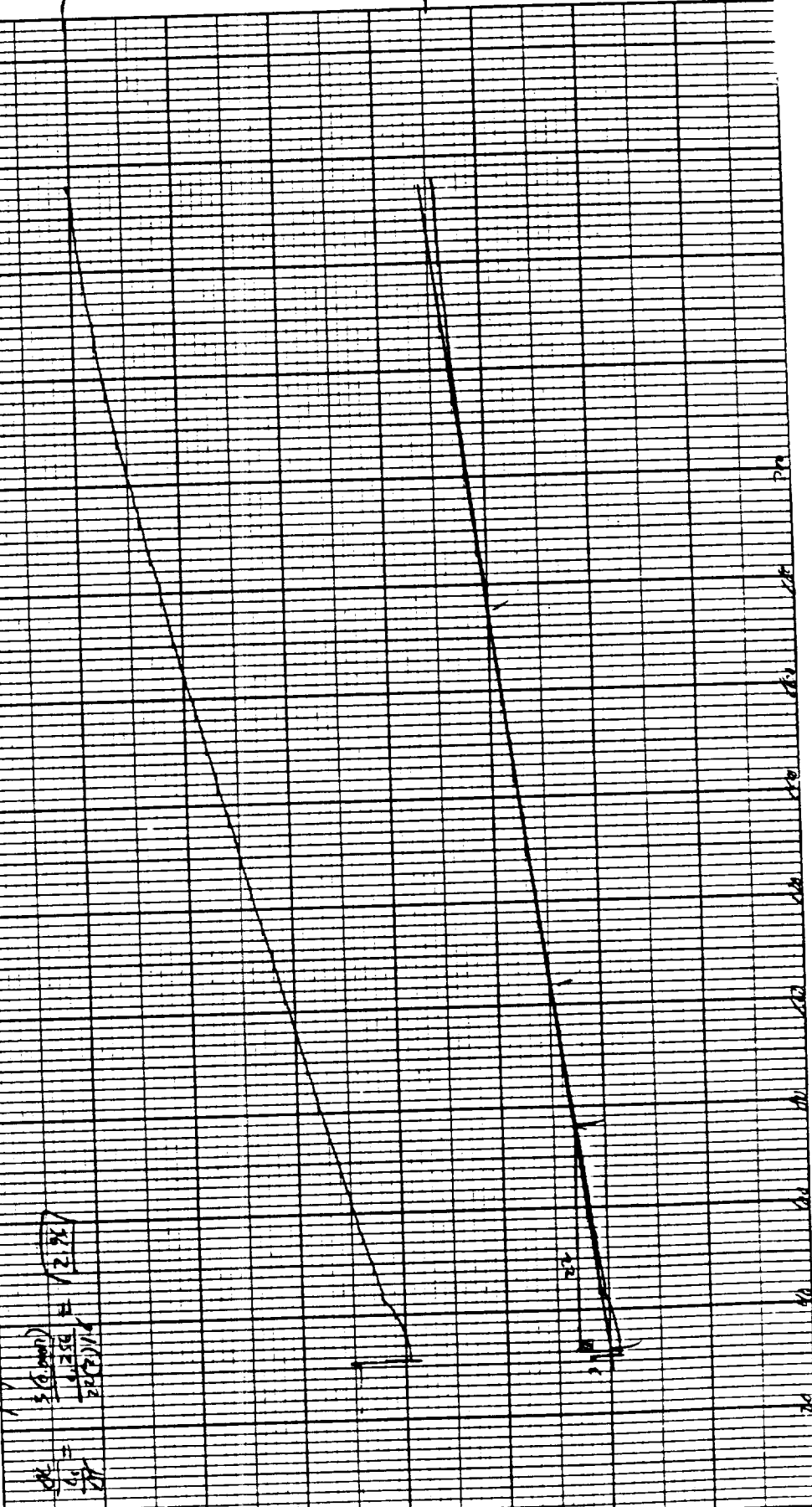
Xp/h

DU PONT Instruments

MEASURED VARIABLE

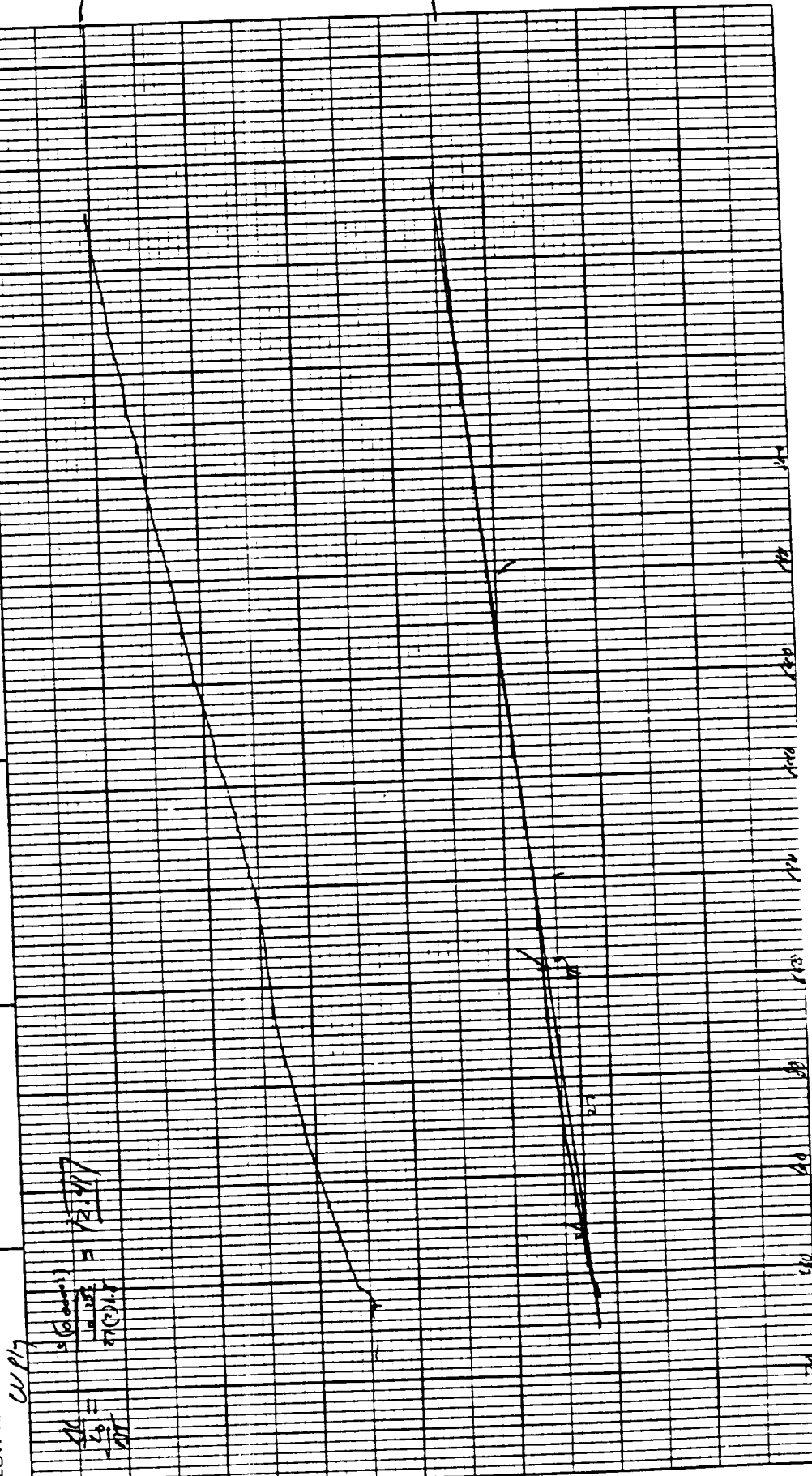
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OF POOR QUALITY

<b>PART NO. 990088</b> RUN NO. <u>DATE 11/1/76</u> OPERATOR <u>DL</u> SAMPLE <u>D05180-3-SP-11</u> ATM. <u>600</u> <u>0-500</u> FLOW RATE <u>15.568</u> <u>copy</u>		<b>T-AXIS</b> SCALE: °C/in <u>50-70</u> PROG RATE: °C/min <u>0</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT. in <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in <u>(mcal/sec)/in</u> WEIGHT. mg <u>REFERENCE</u>	<b>TGA</b> SCALE. mg/in <u>0.1/0.2</u> SUPPRESSION. mg <u>MODE <u>Exhaust</u></u> WEIGHT. mg <u>SAMPLE SIZE <u>0.25g</u></u> TIME CONST. sec <u>LOAD <u>0</u></u> dY. (mg/min) /in <u>dY. (10X) (mils/min) /in</u>	<b>TMA</b> <u>(mils/min)</u> SCALE. mils/in <u>0.1/0.2</u> MODE <u>Exhaust</u> SAMPLE SIZE <u>0.25g</u> LOAD. g <u>0</u> dY. (10X) (mils/min) /in
--	--	---	--	---	--



PART NO. 990083

RUN NO. <u>117160</u> OPERATOR <u>71</u> SAMPLE <u>D09380 - 3.60 - (2)</u> ATM. <u>50</u> FLOW RATE <u>3-5 (c.v.)</u>	<b>T-AXIS</b> SCALE, °C/in. <u>50</u> PROG. RATE, °C/min. <u>10</u> HEAT, °COOL <u>ISO</u> SHIFT, in. <u>0</u>	<b>DTA-DSC</b> SCALE, °C/in. <u>(mcal/sec)/in.</u> WEIGHT, mg <u>REFERENCE</u>	<b>TGA</b> SCALE, mg/in. <u>10</u> SUPPRESSION, mg <u>10</u> WEIGHT, mg <u>10</u> TIME CONST., sec <u>10</u> dY, (mg/min)/in. <u>10</u>	<b>TMA</b> <u>(in./in.)</u> SCALE, mils/in. <u>0.100</u> MODE <u>EXTENSION</u> SAMPLE SIZE <u>0.256</u> LOAD, g <u>10</u> dY, (10X), (mils/min)/in. <u>10</u>
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MEASURED VARIABLE

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OF POOR QUALITY

PART NO. 990088

RUN NO. \_\_\_\_\_ DATE 11/1/84  
OPERATOR DJ  
SAMPLE D65250-3-EM- (3)  
ATM 422 @ 372  
FLOW RATE 3-53 (14)

T-AXIS  
SCALE: °C/in 20  
PROG RATE: °C/min 10  
HEAT COOL ISO  
SHIFT in 0

DTA-DSC  
SCALE: °C/in  
(mcal/sec)/in  
WEIGHT, mg  
REFERENCE

TGA  
SCALE, mg/in  
SUPPRESSION, mg  
WEIGHT, mg  
TIME CONST., sec  
dY, (mg/min) /in

TMA (mm/min)  
SCALE, mils/in 0.1/10.1  
MODE EXTENSION  
SAMPLE SIZE 0.128  
LOAD, g 1  
dY, (10X) (mils/min) /in

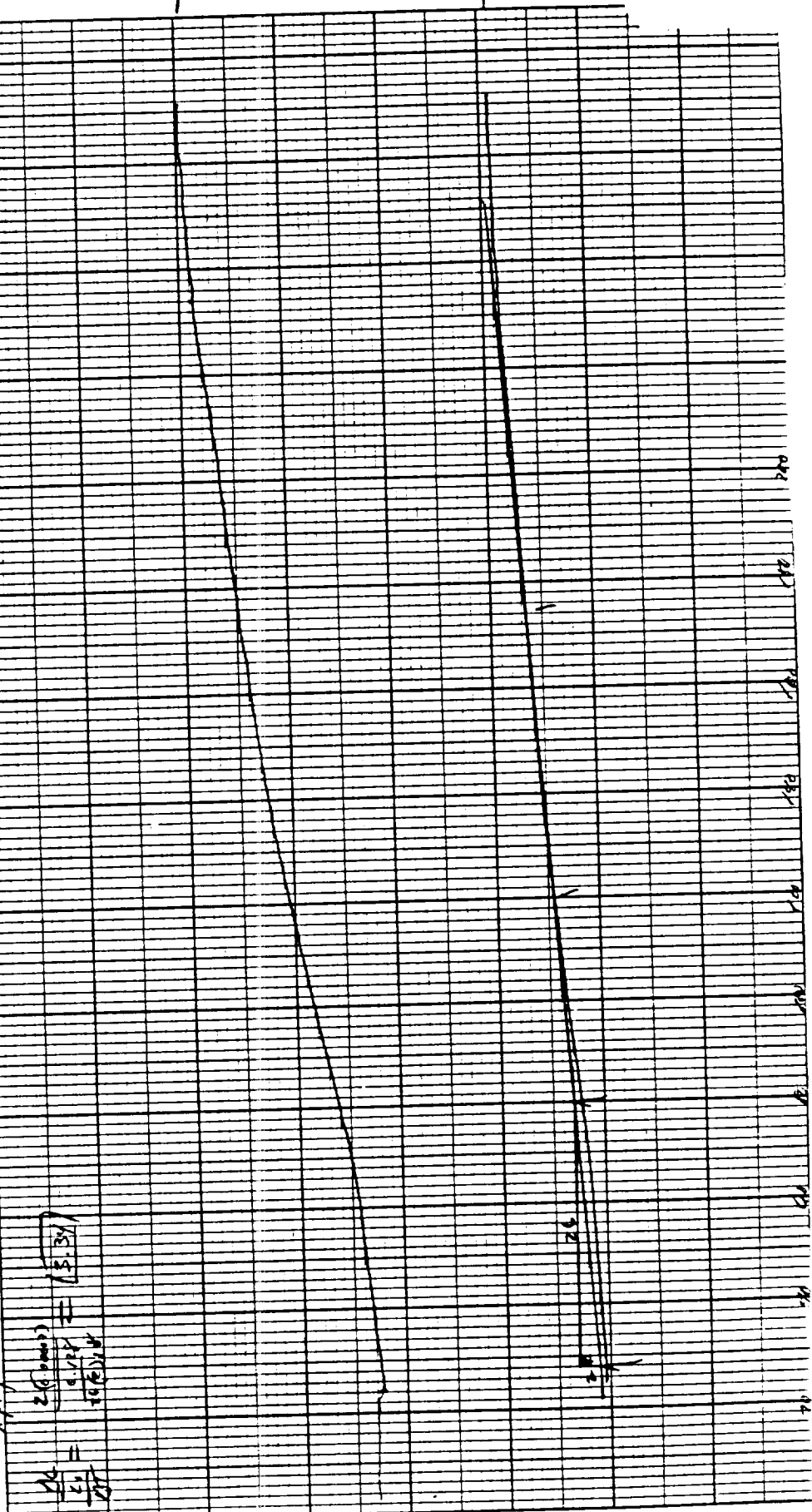
DUPONT Instruments

MEASURED VARIABLE

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$$\frac{26}{12} = \frac{26(1000)}{10(1000)} = 2.6$$

XPL



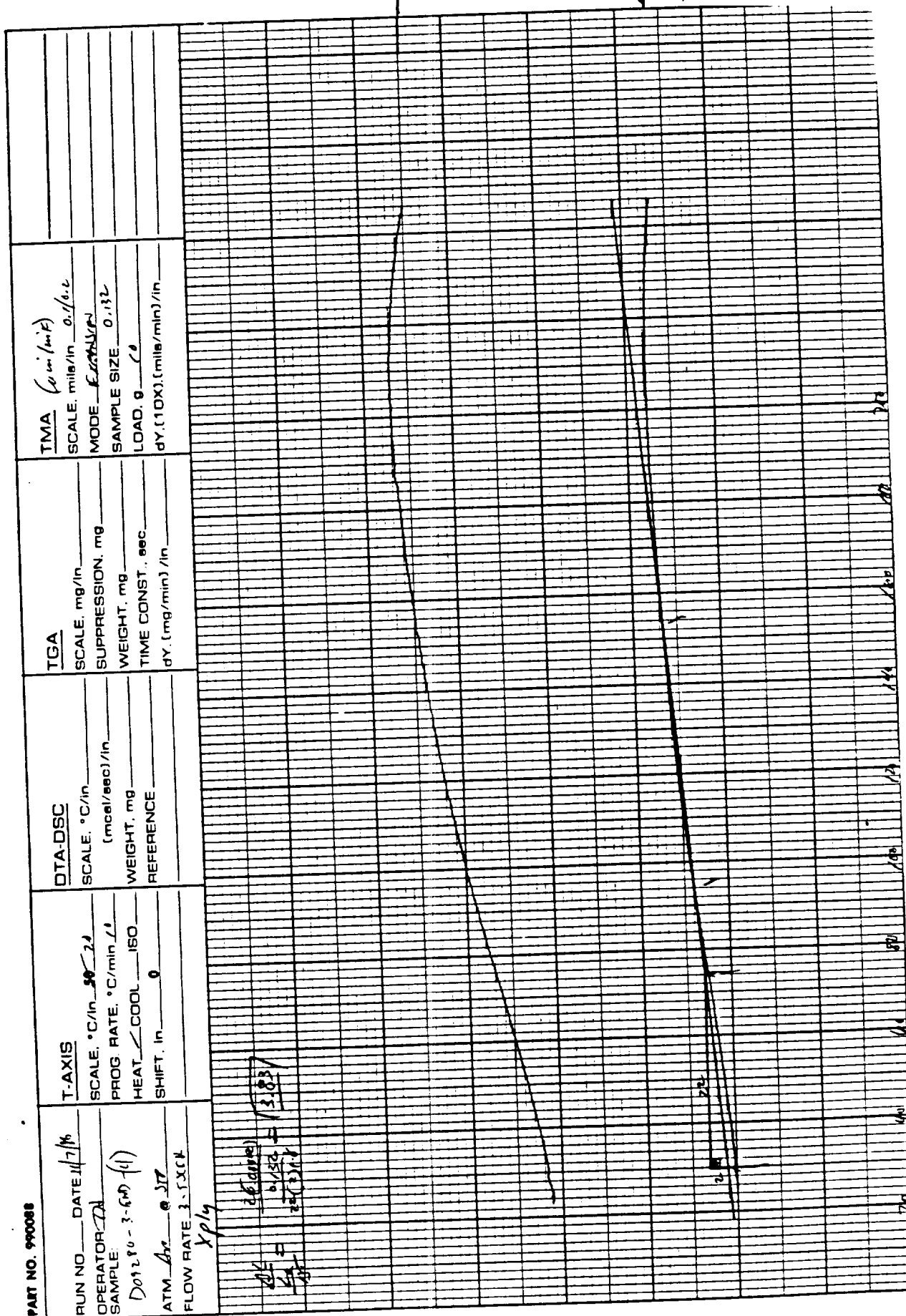


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NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 3

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## FILLER TESTING

NASA-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 3

1. Carbon Content, % QAI-5560	SAMPLE			
	#3A-1	#3A-2	#3A-3	
	99.40	99.32	99.44	
	NASA LOT# 3 AVERAGE		99.39	
2. Ash Content, % PTM-71B	0.000	0.000	0.000	
	0.000	0.000	0.005	
	AVG. 0.000	0.000	0.002	
	NASA LOT# 3 AVERAGE		0.001	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)	#3A-1	#3A-2	#3A-3	LOT#3
				AVG.
	Na 6.0	6.0	6.0	6.0
	K 2.5	1.0	2.0	1.8
	Ca 2.5	2.5	2.0	2.3
	Mg 0.0	0.0	0.0	0.0
	Li 0.0	0.0	0.0	0.0
	TOTAL 11.0	9.5	10.0	10.2
3a. Moisture Content, % CTM-53B	.010	.015	0.000	
	.005	.020	0.000	
	AVG. .008	.018	0.000	
	NASA LOT# 3 AVERAGE		.008	
3b. Ash Content, % CTM-53B	.025	.000	.000	
	.025	.010	.000	
	AVG. .025	.005	.000	
	NASA LOT# 3 AVERAGE		.010	
4. pH, Units ASTM D1512	4.80	4.75	4.85	
	4.95	4.80	4.80	
	AVG. 4.88	4.78	4.82	
	NASA LOT# 3 AVERAGE		4.83	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG. .51	.51	.42	
	Maximum .99	.88	.85	
	Minimum .20	.18	.15	
	Std. Dev .23	.20	.17	
	NASA LOT# 3 AVERAGE SIZE		.48	
6a. TGA, °C at 50% Loss CTM-51	864	860	850	
	NASA LOT# 3 AVERAGE		858	

Filler Lot for NASA Lot# 3

6b. TGA  
CTM-51

See Charts 6A-6C

7. Particle Size Distribution  
CTM-72

See Charts 7A-7C

7a. Particle Size, microns  
CTM-72

	<u>#3A-1</u>	<u>#3A-2</u>	<u>#3A-3</u>
	.89	.94	.89
	<u>.94</u>	<u>.83</u>	<u>.86</u>
AVG.	.92	.88	.88
NASA LOT# 3	AVERAGE		.89

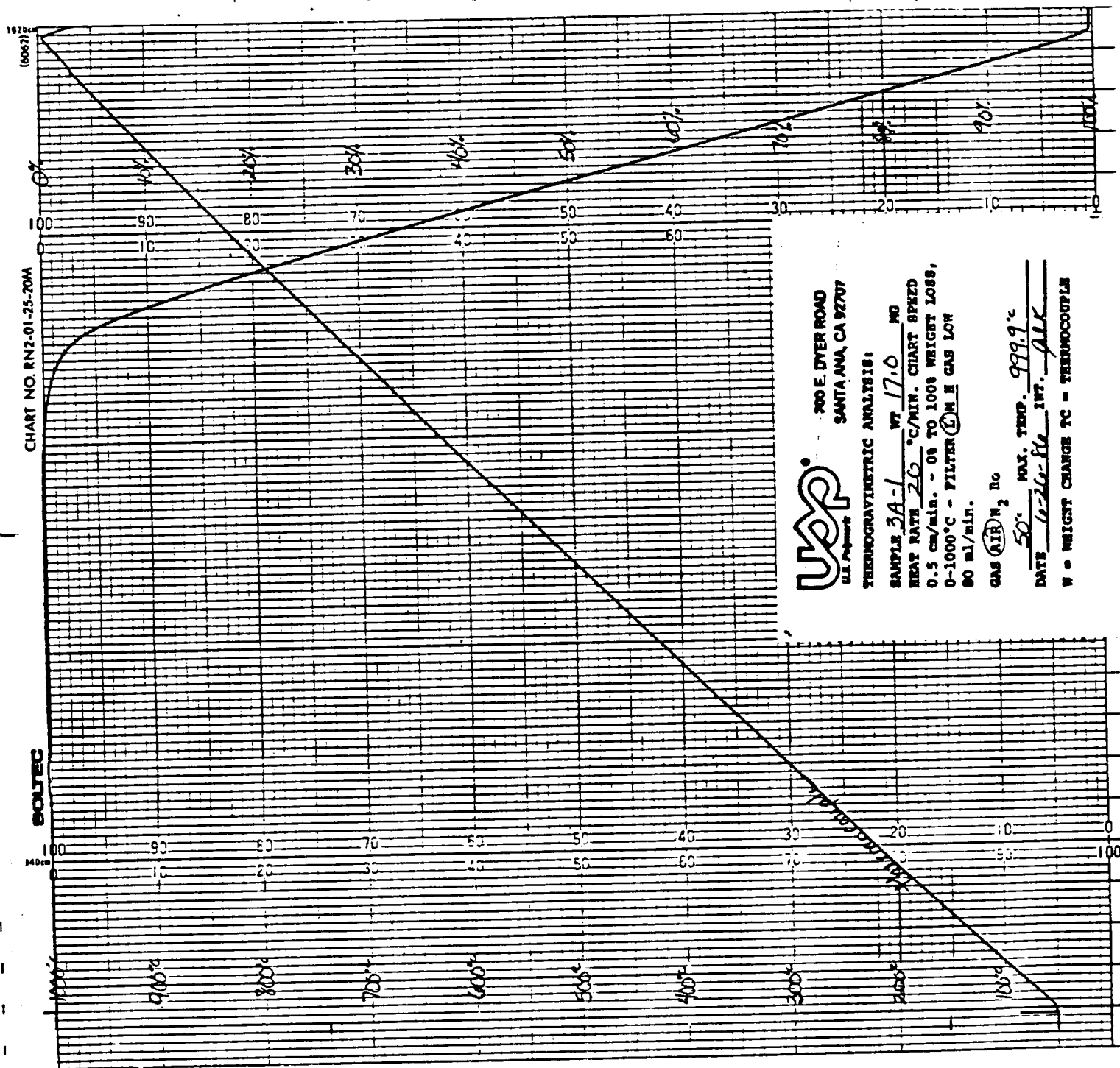
U.S. Polymeric

*Hamid M. Quraishi*

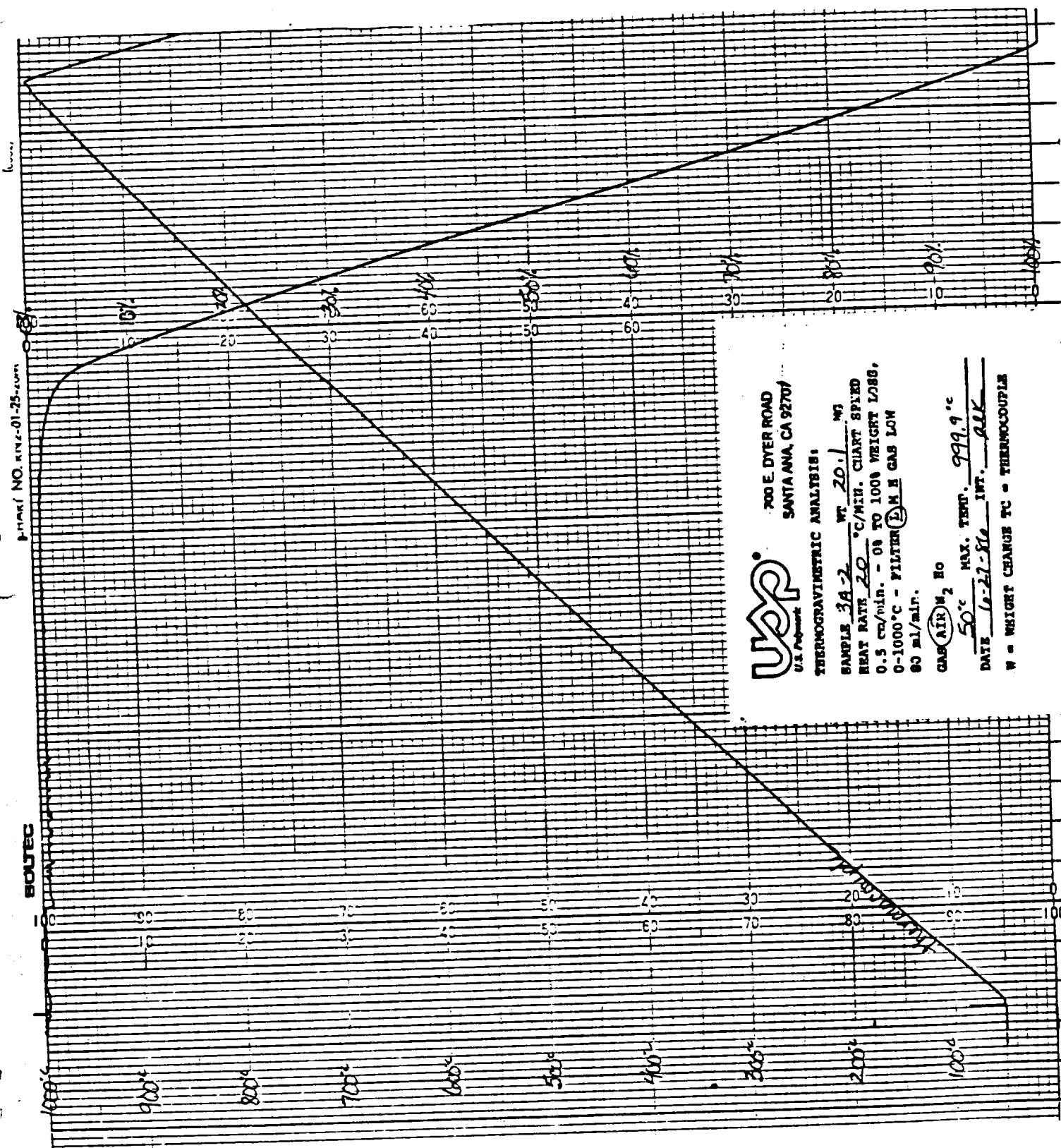
Hamid M. Quraishi, Manager  
Quality Assurance Department



CHART 6A



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**UAP**  
U.S. PATENT  
200 E. DYER ROAD  
SANTA ANA, CA 92701

## THERMOGRAVIMETRIC ANALYSIS:

SAMPLE 3A-2 WT. 20.1 MG  
HEAT RATE 20 °C/MIN. CHART SPEED  
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,  
0-1000°C - FILTER DM IN GAS LOW  
90 ml/min.

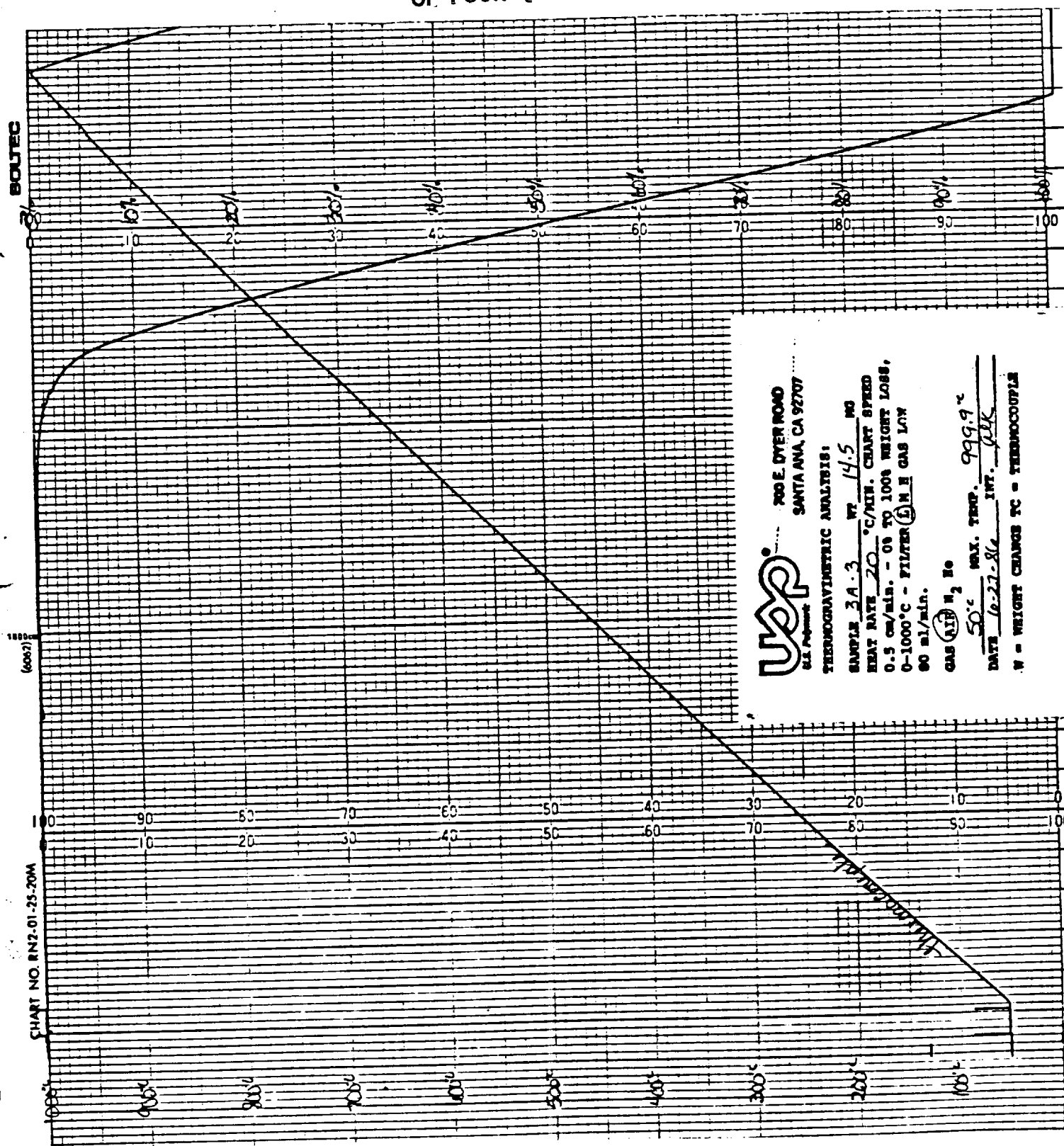
GAS AIR N<sub>2</sub> HO

MAX. TEMP. 999.9 °C

DATE 10-21-86 INT. RLK

W = WEIGHT CHANGE TC = THERMOCOUPLE

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OF POOR QUALITY

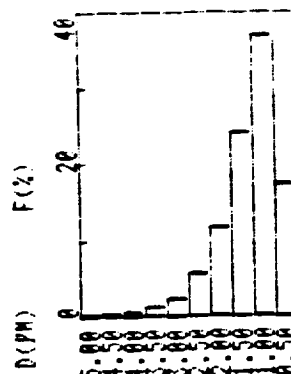


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## \* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.6	0.6
3.50-3.00	1.2	1.8
3.00-2.50	2.3	4.1
2.50-2.00	5.6	9.7
2.00-1.50	11.8	21.5
1.50-1.00	24.2	45.7
1.00-0.50	37.0	82.7
0.50-0.00	17.3	100.0
D(AVE) 0.94 (PM)		

## \* DISTRIBUTION GRAPH (BY VOL.)

Lot 3A-1  
Sample #2

HOPIRA CAPA-500

## PARTICLE ANALYZER

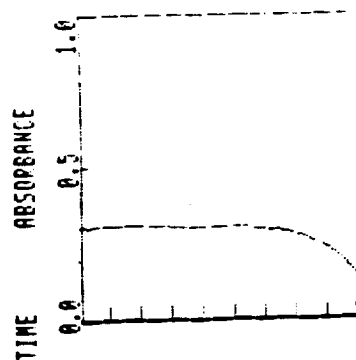
DATE 5-27-86  
SAMPLE NASA LOT#3A1  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

## \* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D (MAX) 5.0 (PM)  
D (MIN) 0.01 (PM)  
D (DIV) 0.50 (PM)  
SPEED 5000. (PPM)

\* TIME 0 H 11 MIN 31 SEC

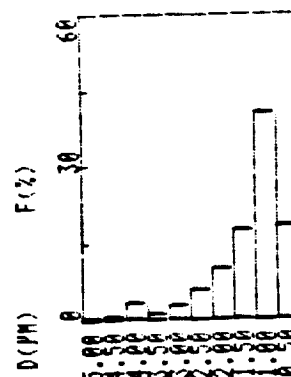
## \* DATA



## \* DISTRIBUTION TABLE (BY VOL.)

D (PM)	F (%)	R (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	3.2	3.6
3.50-3.00	1.0	4.7
3.00-2.50	2.5	7.2
2.50-2.00	6.0	13.1
2.00-1.50	10.2	23.3
1.50-1.00	17.5	40.8
1.00-0.50	40.7	81.5
0.50-0.00	18.5	100.0
D(AVE) 0.89 (PM)		

## \* DISTRIBUTION GRAPH (BY VOL.)

Lot 3A-1  
Sample #1

HOPIRA CAPA-500

## PARTICLE ANALYZER

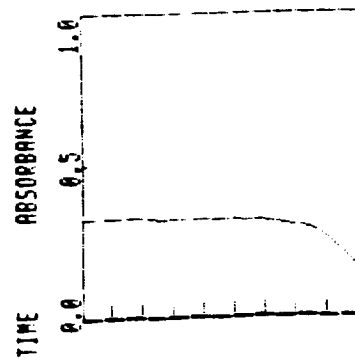
DATE 5-27-86  
SAMPLE NASA LOT#3A1  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

## \* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D (MAX) 5.0 (PM)  
D (MIN) 0.01 (PM)  
D (DIV) 0.50 (PM)  
SPEED 5000. (PPM)

\* TIME 0 H 11 MIN 31 SEC

## \* DATA

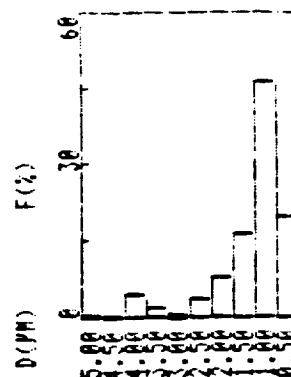


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## \* DISTRIBUTION TABLE (BY VOL.)

D(µM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	4.2	4.2
3.50-3.00	1.6	5.9
3.00-2.50	0.6	6.4
2.50-2.00	3.6	10.0
2.00-1.50	7.8	17.8
1.50-1.00	16.3	34.2
1.00-0.50	46.3	80.5
0.50-0.00	19.5	100.0
D(AVE)	0.83 (µM)	

## \* DISTRIBUTION GRAPH (BY VOL.)

Lot# 3A-2  
Sample#2

HOPPER CAPA-500

PARTICLE ANALYZER

DATE 5-23-86  
SAMPLE NASALOT# 3A-2  
SOLVENT ETHYL GLYCOL  
C=0.1 mg/ml

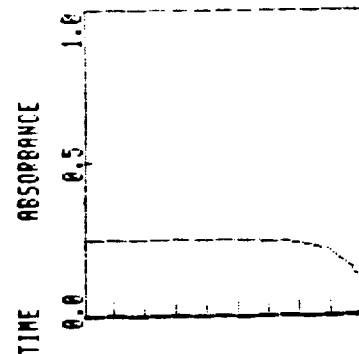
## \* CONDITIONS

SOLV. VISC 19.90(CP)  
SOLV. DENS 1.11(G/CC)  
SAMP. DENS 1.90(G/CC)  
D(MAX) 5.0 (µM)  
D(MIN) 0.01(µM)  
D(DIV) 0.50(µM)

SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

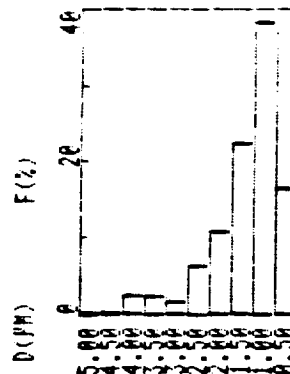
## \* DATA



## \* DISTRIBUTION TABLE (BY VOL.)

D(µM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	2.3	2.3
3.50-3.00	2.4	4.7
3.00-2.50	1.5	6.2
2.50-2.00	6.2	12.5
2.00-1.50	10.6	23.1
1.50-1.00	22.3	45.4
1.00-0.50	38.4	83.8
0.50-0.00	16.2	100.0
D(AVE)	0.94 (µM)	

## \* DISTRIBUTION GRAPH (BY VOL.)

Lot# 3A-2  
Sample#1

HOPPER CAPA-500

PARTICLE ANALYZER

DATE 5-23-86  
SAMPLE NASALOT# 3A-2  
SOLVENT ETHYL GLYCOL  
C=0.1 mg/ml

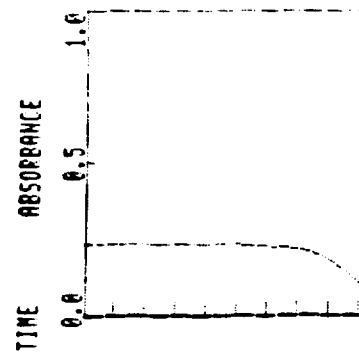
## \* CONDITIONS

SOLV. VISC 19.90(CP)  
SOLV. DENS 1.11(G/CC)  
SAMP. DENS 1.90(G/CC)  
D(MAX) 5.0 (µM)  
D(MIN) 0.01(µM)  
D(DIV) 0.50(µM)

SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

## \* DATA



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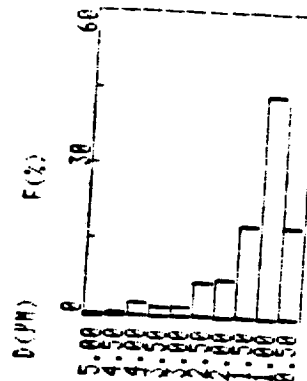
CHART 7C

\* DISTRIBUTION TABLE (BY VOL.)

D(μm)	F(%)	R(%)
5.00	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	2.3	2.8
3.50-3.00	1.8	4.5
3.00-2.50	1.8	6.3
2.50-2.00	6.6	12.9
2.00-1.50	7.5	20.3
1.50-1.00	17.8	38.1
1.00-0.50	44.0	82.1
0.50-0.00	17.9	100.0

D(AVE) 0.86 (μm)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot # 3A-3  
Sample #2

HORIBA CAPP-500  
PARTICLE ANALYZER

DATE 5-23-86  
#2 SAMPLE NASA LOT# 3A-3  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

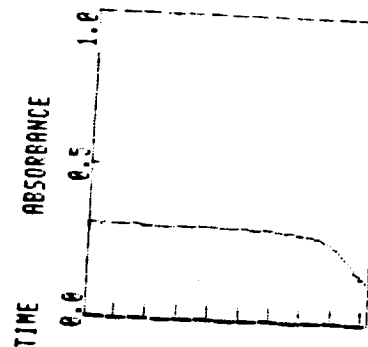
\* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D(MAX) 5.0 (μm)  
D(MIN) 0.01 (μm)  
D(DIV) 0.50 (μm)

SPEED 5000. (RPM)

TIME 0 H 11 MIN 31 SEC

\* DATA

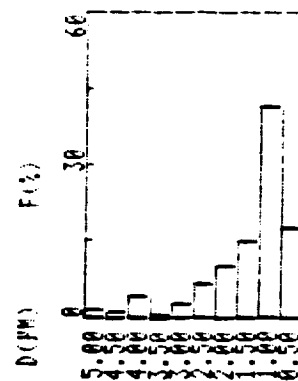


\* DISTRIBUTION TABLE (BY VOL.)

D(μm)	F(%)	R(%)
5.00	0.0	0.0
5.00-4.50	1.4	1.4
4.50-4.00	0.9	2.3
4.00-3.50	4.2	6.5
3.50-3.00	0.3	6.9
3.00-2.50	2.5	9.4
2.50-2.00	6.5	15.9
2.00-1.50	10.0	25.9
1.50-1.00	14.8	40.7
1.00-0.50	41.7	82.3
0.50-0.00	17.7	100.0

D(AVE) 0.89 (μm)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot# 3A-3  
Sample #1

HORIBA CAPP-500  
PARTICLE ANALYZER

DATE 5-23-86  
#1 SAMPLE NASA LOT# 3A-3  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml

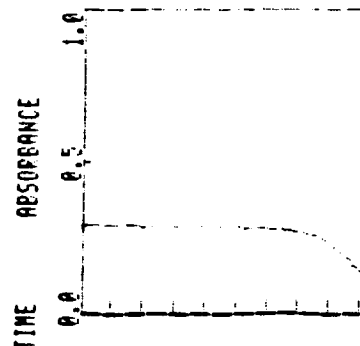
\* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D(MAX) 5.0 (μm)  
D(MIN) 0.01 (μm)  
D(DIV) 0.50 (μm)

SPEED 5000. (RPM)

TIME 0 H 11 MIN 31 SEC

\* DATA



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NAS8-36298

U.S. Polymeric O.E. 71108

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13. Chang's Index.....	2
14. RDS.....	2
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RDS.....	14A
NMR.....	15A



## RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 3

1. Resin Solids, % PTM-7C	#3-1 79.3 78.1 <u>77.2</u> AVG. 78.2
2. Specific Gravity @ 25°C PTM-29C	1.181
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C	15,000
4. Gel Time, min:sec PTM-47B	4:22
5. Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)	Na 18.0 K 1.8 Ca 5.8 Mg 1.3 Li <u>0.0</u> TOTAL 26.8
6. Volatiles, Gas Chromatography CTM-55	See Charts 6A
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	39.9 See Chart 7A
8. DSC, temperature °C CTM-50A	185 See Chart 8A
9. HPLC CTM-49A	See Chart 9A
10. GPC, Average molecular wt. CTM-49A	1932 See Chart 10A
11. pH, units CTM-1B	8.2



USP-39A Resin Lot for NASA Lot# 3

12. Phenol Content, %	#3-1	
CTM-55 Appendix 1	11.64	
	<u>12.02</u>	
	AVG. 11.83	
13. Chang's Index, ml.	22.2	
CTM-5B		
14. RDS, Minimum Viscosity, cps.	<u>Min. Visc.</u>	<u>°C</u>
CTM-57A	#3-1 175	111
	See Charts 14A	
15. NMR	See Charts 15A	
Vendor procedure		

U. S. Polymeric

  
Hamid M. Quraishi, Manager  
Quality Assurance Department

# TYPICAL GAS CHROMATOGRAPH SET-UP

ORIGINAL SOURCE OF  
OF POOR QUALITY

Operator <u>D. J. Z.</u>	Date <u>12/16/86</u>
Column <u>6 ft.</u>	Detector <u>FID</u>
Length <u>1/4 in.</u>	Voltage <u>        </u>
Dia. <u>1/4 in.</u>	Sensit. <u>        </u>
Liquid Phase <u>AT-1000</u>	Flow Rates, ml/min
Wt. % <u>0.1</u>	Hydrogen <u>60</u> Air <u>96</u>
Support <u>GRAPH-PAC</u>	Scavenge <u>        </u>
Mesh <u>80/100</u>	Split <u>        </u>
Carrier Gas <u>He</u>	Temperature, °C
Rotameter <u>        </u>	Det. <u>220</u> Inj. <u>200</u>
Inlet Press <u>60</u> psig	Column Initial <u>60</u>
Rate <u>30</u> ml/min	Final <u>210</u>
CHART SPEED <u>        </u>	Rate <u>5°C/MIN</u>
SAMPLE <u>USP39A, 3-1</u>	Solvent <u>THF</u>
Size <u>0.05 in.</u>	Concn. <u>0.10892 g/ml</u>

## GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

### STANDARD SOLVENT/MONOMER

### RETENTION TIME (MINS.)

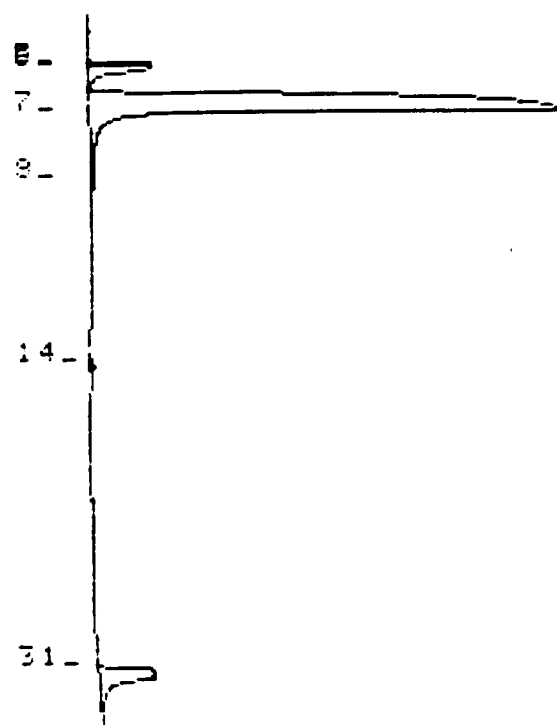
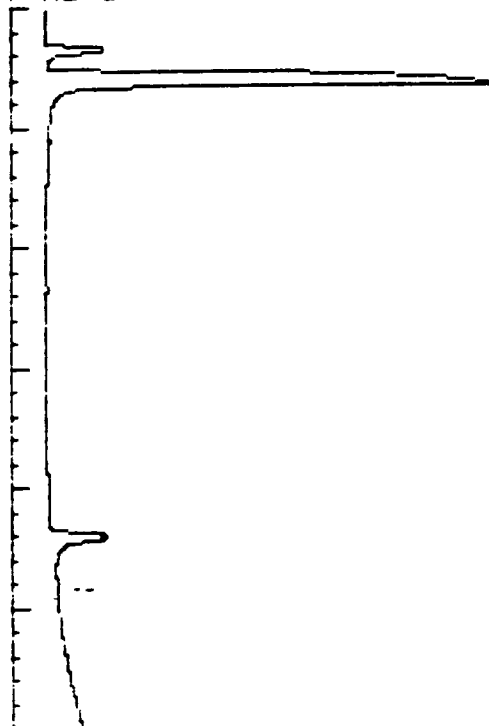
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

ORIGINAL PAGE IS  
OF POOR QUALITY

VERTICAL SCALE FACTOR=1X

\*\*\* REAL TIME CHROMATOGRAM \*\*\*



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 3-1  
MISC.: C=0.10892 GMS/ML

TIME: 15:29  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.65	1477	.041	2	220
5	1.70	76001	2.105	2	11151
6	1.80	187200	5.164	2	11148
7	3.30	2984100	82.637	2	85858
8	5.60	8003	.222	3	589
14	11.75	11088	.307	1	635
31	21.97	343230	9.505	2	10407

TOTAL AREA= 3611095  
THRESHOLD= 1  
MIN. PK. WIDTH= 15  
AREA REJECT= 1000

SAMPLE: USP39A 3-1  
MISC.: C=0.10892 GMS/ML

TIME: 15:29  
DATE: 12/11/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.70	76001	2.117	2	11151
6	1.80	187200	5.214	2	11148
7	3.30	2984100	83.110	2	85858
31	21.93	343230	9.559	3	10407

TOTAL AREA= 3590531  
THRESHOLD= 1  
MIN. PK. WIDTH= 15  
AREA REJECT= 12000

ORIGINAL PAGE IS  
OF POOR QUALITY

CHART 7A

Sample: USP39A71108 3-1

Size: 23.424 mg

Run No: MIR #13079 (12)

Date: MAY/21/86 12:58

Operator: M. WEGENER

Disk ID: DATA DISK #107

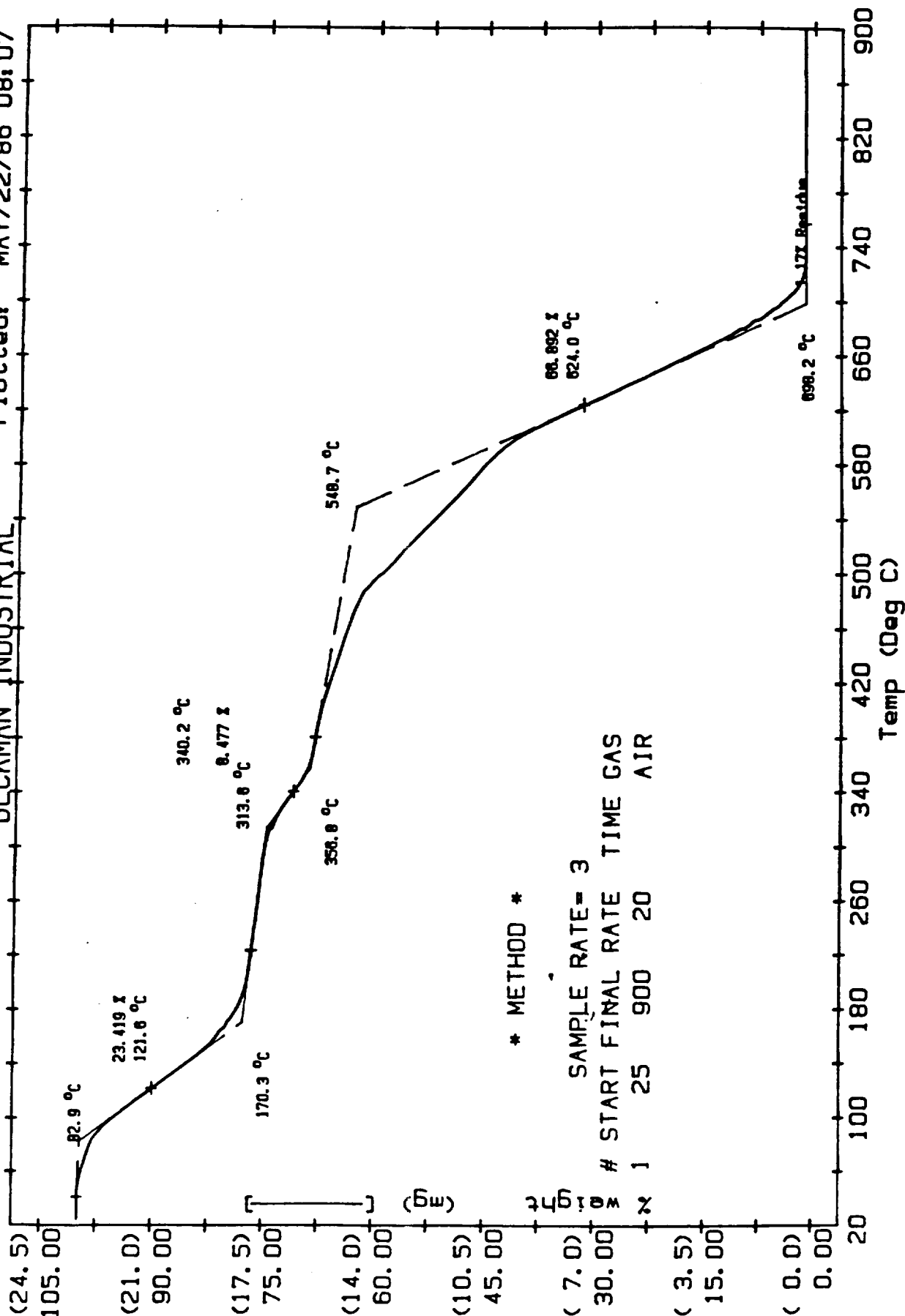
File No: D 36.DAT V2.1

Plotted: MAY/22/86 08:07

TGA

OMNITHERM DATA SYSTEM

BECKMAN INDUSTRIAL



\* METHOD \*

SAMPLE RATE= 3

# START FINAL RATE TIME GAS

1 25 900 20 AIR

**Beckman Industrial™**

ANALYTICAL LABORATORY SERVICES

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OF POOR QUALITY

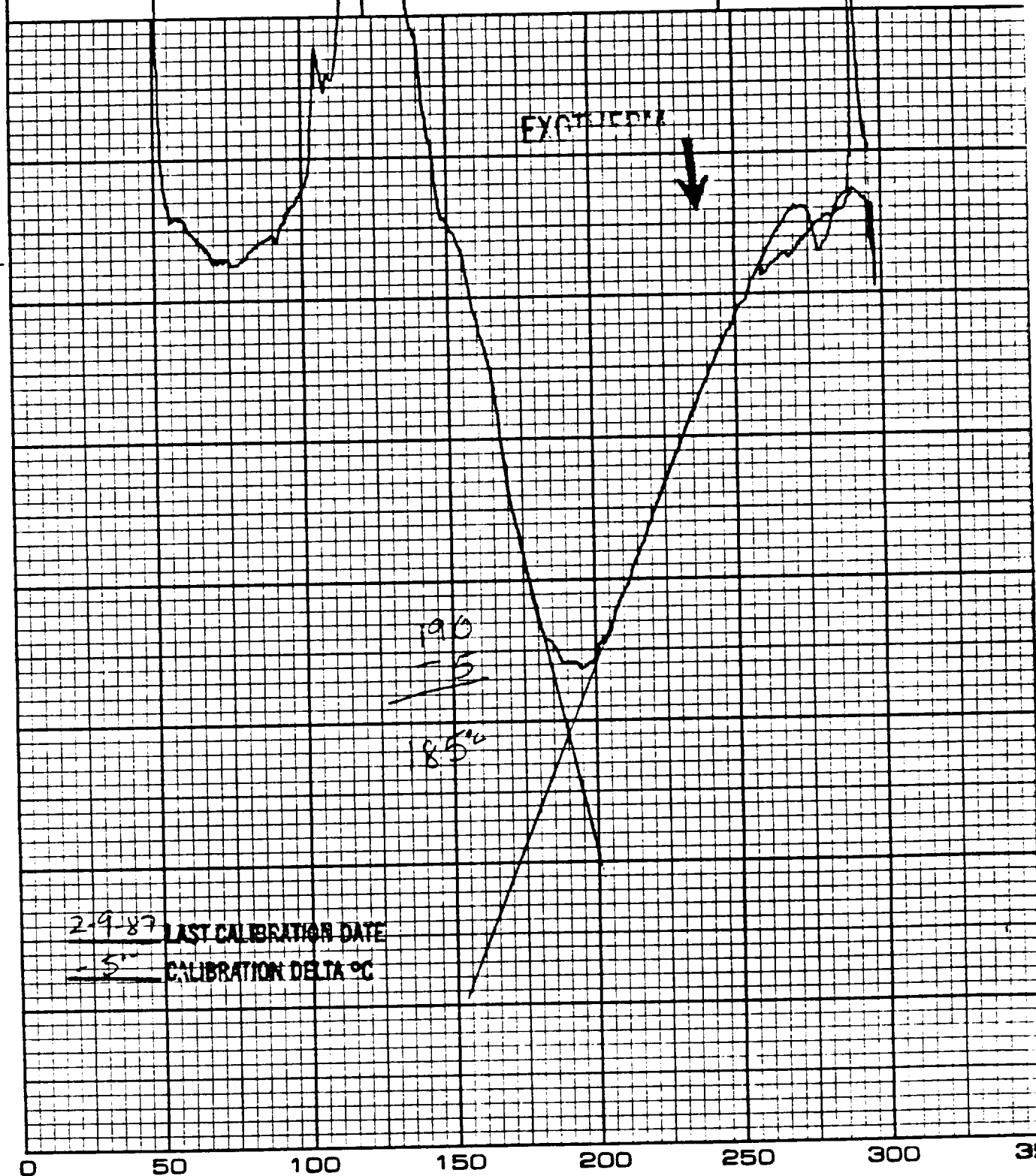
PART NO. 920088

CHART 8A

RUN NO.	DATE <u>2-23-87</u>	T-AXIS	DTA-DSC
OPERATOR	<u>gsk</u>	SCALE, °C/in. <u>50</u>	SCALE, °C/in. <u>1.0/5x</u>
SAMPLE:	<u>3-1</u>	PROG. RATE, °C/min <u>20°</u>	(mcal/sec)/in. _____
<u>usp39A</u>		HEAT <input checked="" type="checkbox"/> COOL _____ ISO _____	WEIGHT, mg <u>3.8</u>
ATM <u>N<sub>2</sub></u> @ <u>1 atm</u>		SHIFT, in. <u>0</u>	REFERENCE _____
FLOW RATE <u>40 ml/min</u>			<u>1 atm seal</u>

**DU PONT** Instruments

MEASURED VARIABLE \_\_\_\_\_



DATA FILE A:PHEND28.HDR TAKEN 09-05-1986 11:46:23

## \*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

\*\*\*\*\*

\* Sample Name: USP39A,3-1,C=6.93      Operator Initials: JGZ

\* Date: 09-05-1986 11:46:23 Method:PHENDLIC      DATA FILE: A:PHEND28.PTS

\* Interface: 4      Cycle#: 28      Channel#: 0      Vial#: N.A.

\* Starting Peak Width: 10      Threshold: .01

\*\*\*\*\*

\* Instrument Type: BECKMAN HPLC      Column Type: MICROBONDAPAK C-18

\*      Solvent Description: THF/WATER, 2:1 BY WEIGHT

\*      Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN

\*      Detector 0: 220NM/.5AU      Detector 1:

\*      Misc. Information: LENGTH=25

\*\*\*\*\*

Starting Delay: 0.00      Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.78	89260	53.0494	2	5100	100.000	17.5
3	1.93	25796	15.3310	2	4619	28.899	5.6
4	2.03	53203	31.6196	2	4863	59.604	10.9

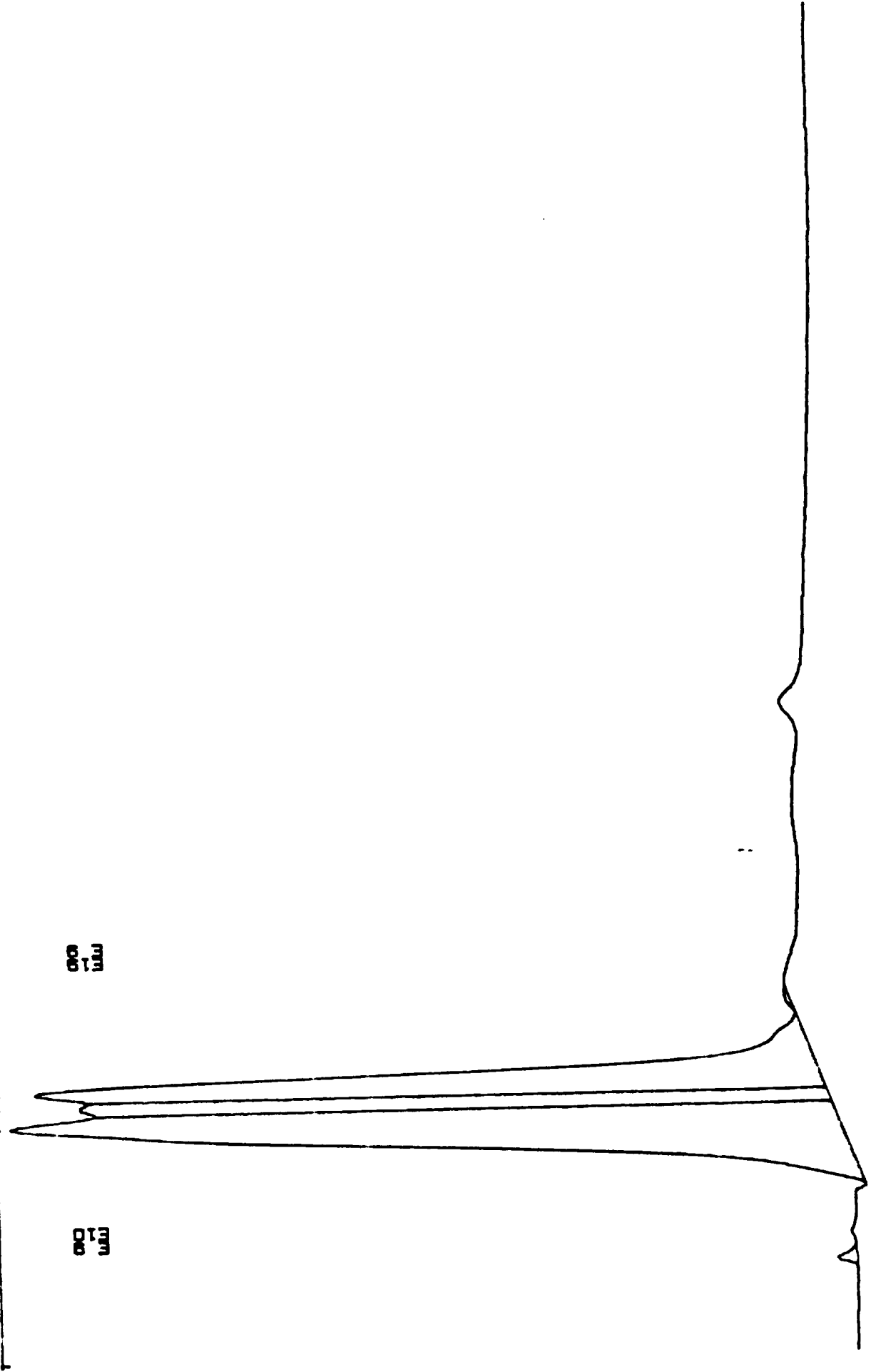
Total Area: 168258      Area Reject: 1000      One sample per 1.000 sec.

OF POOR QUALITY

DATA FILE=PHEND28 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.422 Mv. HIGH SCALE= 10.700 Mv.  
USP-39A, 3-1. C-6.93 MG/ML, 9/5/86, JGZ

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# GPC CALIBRATION PLOT

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OF POOR QUALITY

\*\*\* Calibration Data \*\*\*

Calibration Name:  
Misc Information:

Fit Type: 3

Log Mol Wt =  $A + Bx + Cx^2 + Dx^3$

A= 2.538977

B= 2.115815 C= -.5646824

D= 3.606432E-02

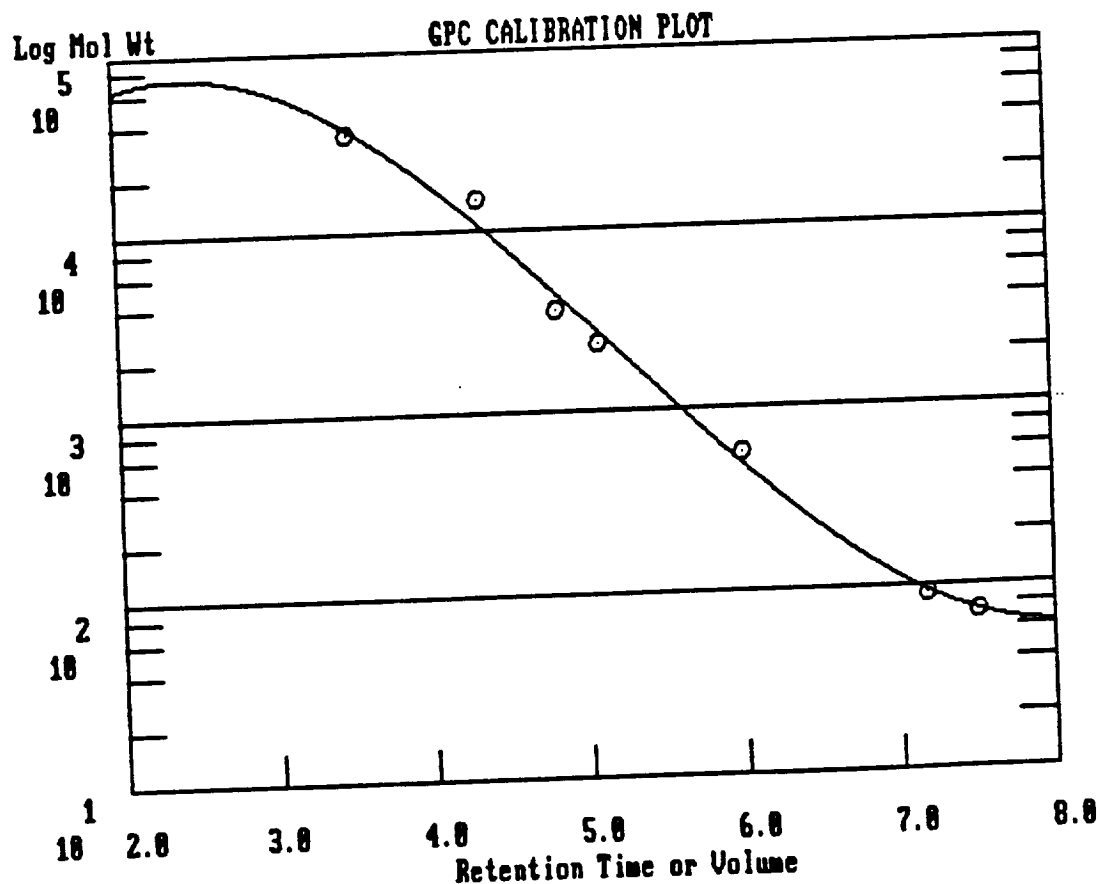
Coefficient of Determination: 0.9902

Ret Time

Molecular Weight

Log Mol Wt

3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857





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OF POOR QUALITY

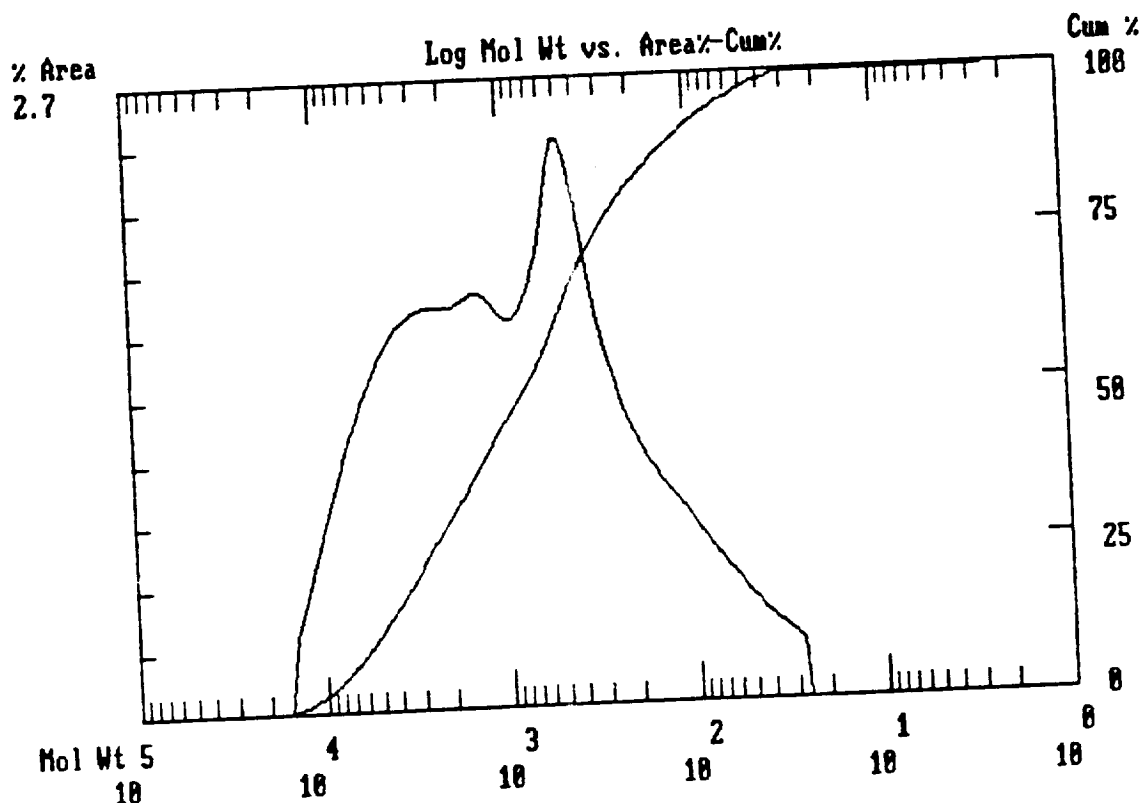
FILE A:GPC35.HDR TAKEN 08-05-1986 17:53:34

\*\*\*\*\* GPC REPORT \*\*\*\*\*

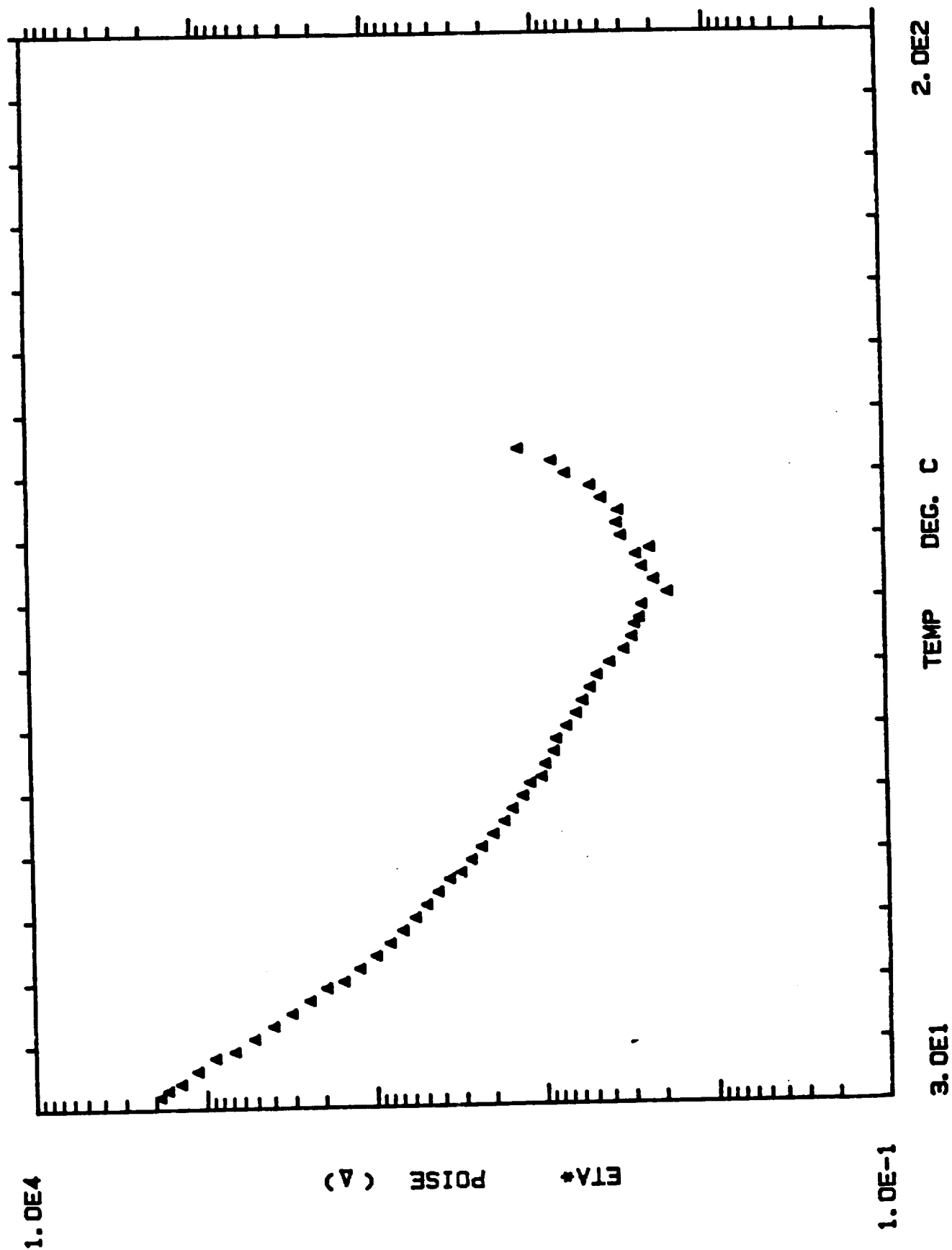
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*****
* *****
* Sample Name: USP39A 3-1=2.68      Operator Initials: GBF      *
* Date: 08-05-1986 16:21:21 Method: DATA FILE: A:GPC35.FTS      *
* Interface: 5                      Cycle#: 35      Channel#: 0    Vial#: N.A.      *
* Starting Peak Width: 60      Threshold: 0      *
* *****
* Instrument Type: HPLC/BECKMAN      Column Type: ULTRASTYRAGEL 500A      *
* Solvent Description: THF      *
* Operating Conditions: T=35C FLOWRATE=2.0ML/MIN      *
* Detector 0: 254NM/.1AU      Detector 1:      *
* Misc. Information: CALIBRATION/GPC      *
* *****
* Starting Delay: 0.00      Ending Retention Time: 10.00
* Calibration file: GPCPHEN
* Molecular Weight Distribution Averages
* Baseline TIMES: 3.85 to 10.00 MW: 22295 to 2
* Process TIMES: 3.85 to 10.00 MW: 22295 to 2
* Total Area: 203112
* Mw= 1932
* Mn= 297
* Mw Mn= 6.5017
* I2 5426
* 1642

```



NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT 3-1



Experiment No. : 4      Sample No. : 1

Title:  
NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT 3-1

Operator : CP

Date and Time : Friday, August 15, 1986 - 15:26:35

Operating Mode : DYNAMIC

Step Type : CURE

Geometry : DISK & PLATE  
RADIUS : 25.00  
GAP : 0.50

Notes :  
STRAIN =50%  
FREQUENCY =10 RAD/SEC

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OF POOR QUALITY

O.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.827e+003	1.826e+003	4.904e+001	2.316e+002	2.000e-001	3.200e+001
2	1.830e+003	1.829e+003	3.896e+001	2.321e+002	1.000e+000	3.200e+001
3	1.640e+003	1.640e+003	3.551e+001	2.080e+002	2.000e+000	3.300e+001
4	1.376e+003	1.376e+003	3.174e+001	1.742e+002	3.000e+000	3.400e+001
5	1.096e+003	1.096e+003	2.514e+001	1.385e+002	4.000e+000	3.600e+001
6	8.598e+002	8.598e+002	2.120e+001	1.086e+002	5.000e+000	3.800e+001
7	6.593e+002	6.589e+002	2.233e+001	8.311e+001	6.000e+000	3.900e+001
8	5.063e+002	5.058e+002	2.205e+001	6.380e+001	7.000e+000	4.100e+001
9	3.903e+002	3.897e+002	2.009e+001	4.915e+001	8.000e+000	4.300e+001
10	3.032e+002	3.026e+002	2.016e+001	3.815e+001	9.000e+000	4.500e+001
11	2.362e+002	2.354e+002	2.004e+001	2.972e+001	1.000e+001	4.700e+001
12	1.873e+002	1.862e+002	2.007e+001	2.354e+001	1.100e+001	4.900e+001
13	1.488e+002	1.476e+002	1.513e+001	1.871e+001	1.200e+001	5.000e+001
14	1.200e+002	1.186e+002	1.818e+001	1.507e+001	1.300e+001	5.200e+001
15	9.599e+001	9.484e+001	1.479e+001	1.206e+001	1.400e+001	5.400e+001
16	7.890e+001	7.793e+001	1.230e+001	9.907e+000	1.500e+001	5.600e+001
17	6.639e+001	6.550e+001	1.082e+001	8.341e+000	1.600e+001	5.800e+001
18	5.590e+001	5.513e+001	9.240e+000	7.026e+000	1.700e+001	6.000e+001
19	4.797e+001	4.733e+001	7.814e+000	6.021e+000	1.800e+001	6.200e+001
20	4.102e+001	4.046e+001	6.764e+000	5.151e+000	1.900e+001	6.400e+001
21	3.510e+001	3.463e+001	5.702e+000	4.404e+000	2.000e+001	6.600e+001
22	3.006e+001	2.968e+001	4.734e+000	3.774e+000	2.100e+001	6.700e+001
23	2.608e+001	2.573e+001	4.225e+000	3.272e+000	2.200e+001	6.900e+001
24	2.257e+001	2.228e+001	3.622e+000	2.834e+000	2.300e+001	7.100e+001
25	1.929e+001	1.904e+001	3.129e+000	2.424e+000	2.400e+001	7.300e+001
26	1.656e+001	1.636e+001	2.532e+000	2.077e+000	2.500e+001	7.500e+001
27	1.472e+001	1.454e+001	2.270e+000	1.850e+000	2.600e+001	7.700e+001
28	1.330e+001	1.262e+001	2.161e+000	1.607e+000	2.700e+001	7.900e+001
29	1.155e+001	1.135e+001	2.176e+000	1.451e+000	2.800e+001	8.100e+001
30	9.881e+000	9.736e+000	1.688e+000	1.240e+000	2.900e+001	8.200e+001
31	9.387e+000	9.266e+000	1.504e+000	1.179e+000	3.000e+001	8.400e+001
32	8.299e+000	8.216e+000	1.170e+000	1.043e+000	3.100e+001	8.600e+001
33	8.047e+000	7.971e+000	1.102e+000	1.010e+000	3.200e+001	8.800e+001
34	6.981e+000	6.935e+000	8.019e-001	8.771e-001	3.300e+001	9.000e+001
35	6.092e+000	6.035e+000	8.276e-001	7.648e-001	3.400e+001	9.200e+001
36	5.588e+000	5.549e+000	6.617e-001	7.020e-001	3.500e+001	9.400e+001
37	5.038e+000	5.020e+000	4.197e-001	6.330e-001	3.600e+001	9.600e+001
38	4.581e+000	4.579e+000	1.556e-001	5.751e-001	3.700e+001	9.800e+001
39	3.851e+000	3.846e+000	1.960e-001	4.837e-001	3.800e+001	1.000e+002
40	3.181e+000	3.171e+000	2.447e-001	3.992e-001	3.900e+001	1.020e+002
41	2.850e+000	2.840e+000	2.398e-001	3.520e-001	4.000e+001	1.040e+002
42	2.731e+000	2.716e+000	2.832e-001	3.428e-001	4.100e+001	1.060e+002
43	2.562e+000	2.464e+000	7.029e-001	3.219e-001	4.200e+001	1.070e+002
44	2.467e+000	2.107e+000	1.283e+000	3.095e-001	4.300e+001	1.090e+002
45	1.750e+000	1.578e+000	7.560e-001	2.198e-001	4.400e+001	1.110e+002
46	2.104e+000	1.951e+000	7.875e-001	2.644e-001	4.500e+001	1.130e+002
47	2.460e+000	2.178e+000	1.143e+000	3.089e-001	4.600e+001	1.150e+002
48	2.662e+000	2.344e+000	1.262e+000	3.343e-001	4.700e+001	1.170e+002
49	2.198e+000	1.876e+000	1.146e+000	2.759e-001	4.800e+001	1.180e+002
50	3.259e+000	2.684e+000	1.796e+000	4.056e-001	4.900e+001	1.200e+002

ORIGINAL PAGE IS  
OF POOR QUALITY

NO.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
52	3.422e+000	2.954e+000	1.761e+000	4.297e-001	5.000e+001	1.220e+002
53	3.324e+000	2.903e+000	1.619e+000	4.175e-001	5.100e+001	1.240e+002
53	4.180e+000	3.654e+000	2.032e+000	5.247e-001	5.200e+001	1.260e+002
54	4.842e+000	4.446e+000	1.918e+000	6.081e-001	5.300e+001	1.280e+002
55	6.760e+000	6.299e+000	2.453e+000	8.497e-001	5.400e+001	1.300e+002
56	8.108e+000	7.529e+000	3.010e+000	1.018e+000	5.500e+001	1.320e+002
57	1.276e+001	1.180e+001	4.853e+000	1.603e+000	5.600e+001	1.340e+002

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OF POOR QUALITY

SOLVENT ONLY  
SCAN

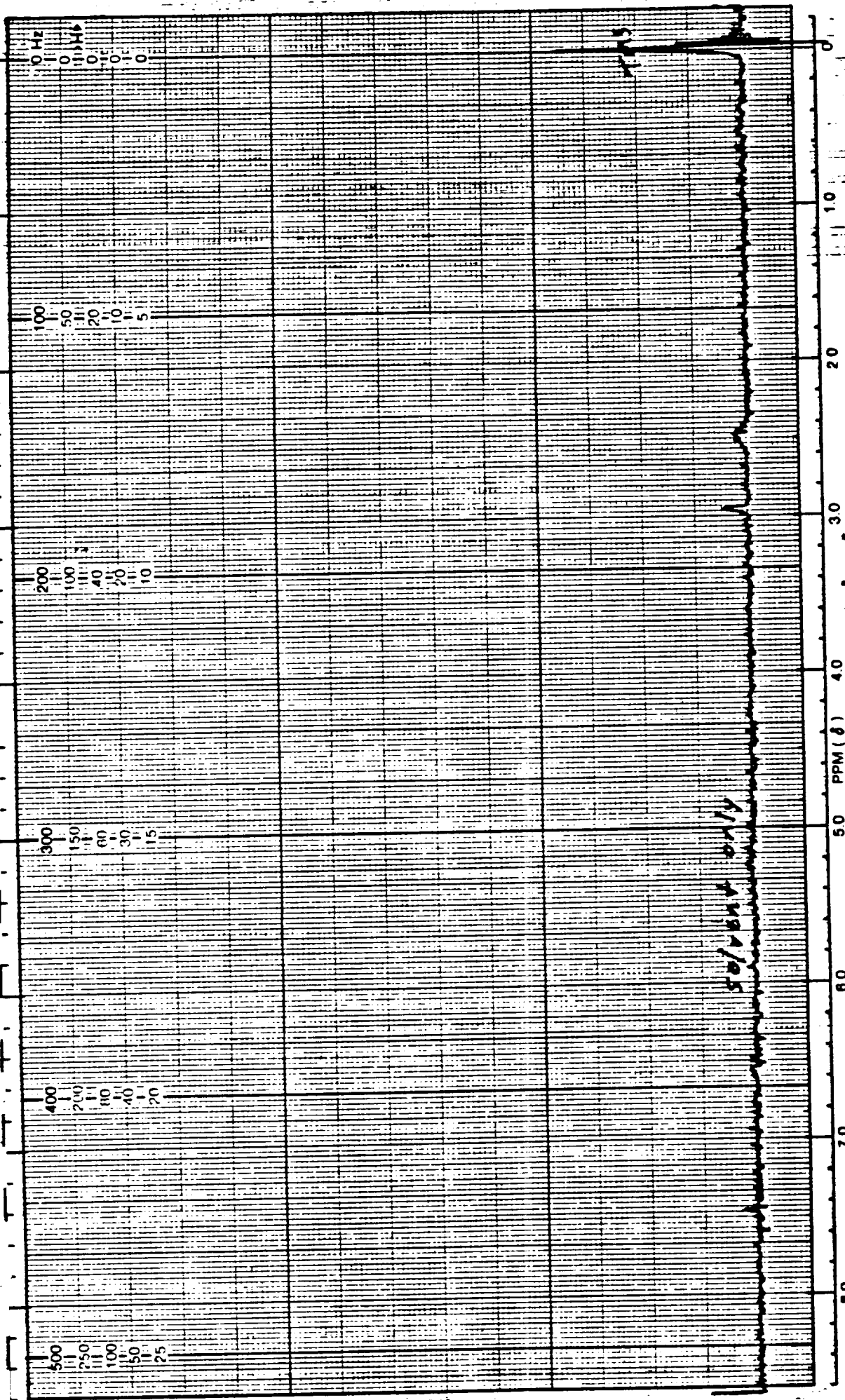
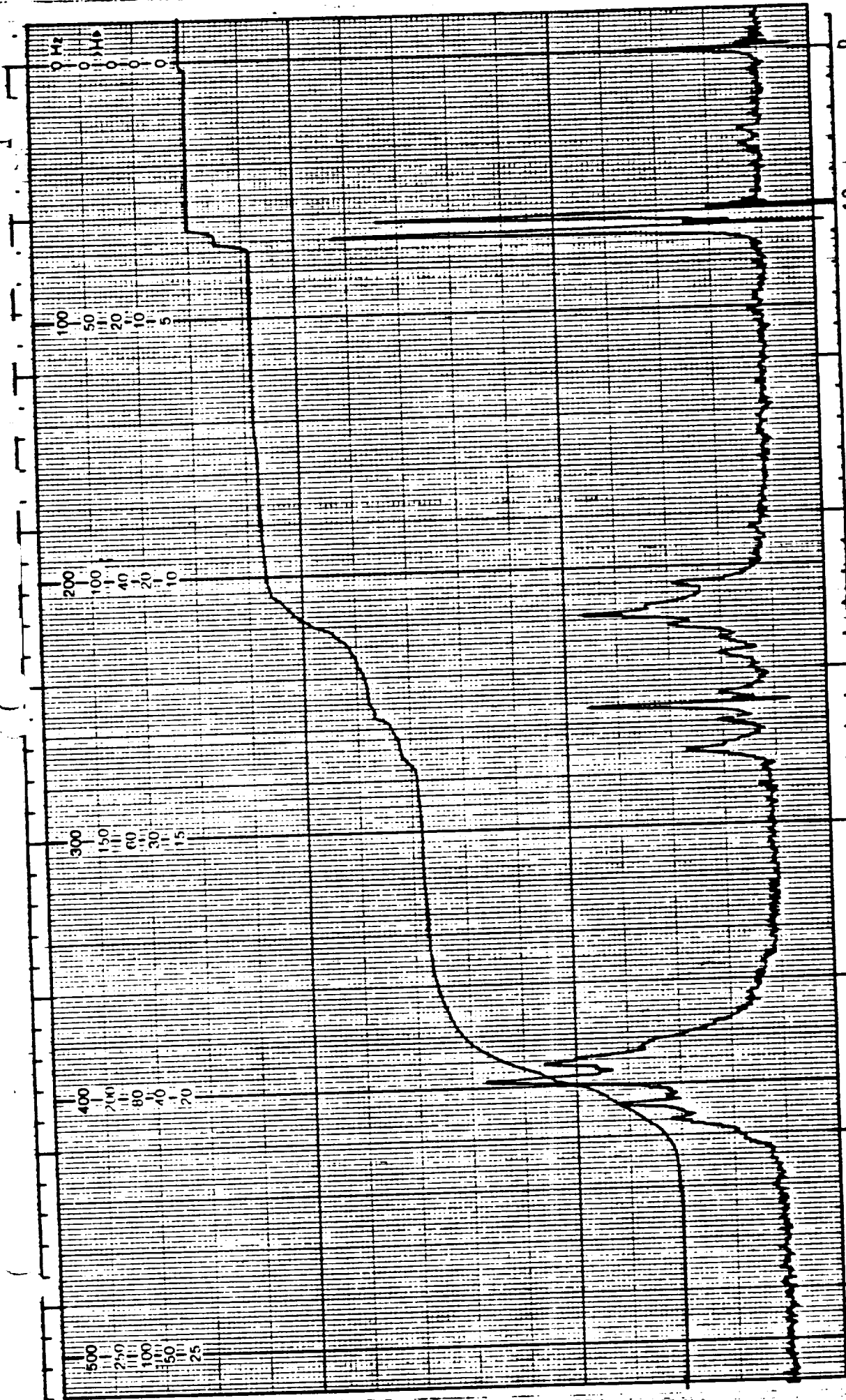


CHART 15A



REMARKS: 0.137 gm sample  
0.437 gm solvent

SAMPLE: USP-39A 4-83-1  
SOLVENT: Unisol-d + 0.587AS  
DEG. LEVEL: \_\_\_\_\_

ORIGINAL OF POOR QUALITY

OPERATOR: DOW

DATE: 3-21-86

SPECTRUM NO: 5077 USP-39A 4-83-1

SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 8.0  
INTEGRAL AMPLITUDE: 5.0  
SPINNING RATE (RPS): 3.0

MANUAL ☒ AUTO ☐  
SWEEP TIME (SEC): 30 15 10 5 2.5 1.0 0.5  
SWEEP WIDTH (Hz): 25 50 100 200 300  
FILTER: 1 2 3 4 5 6 7 8  
RF POWER LEVEL: 0.25

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 3 (KAISER)

<u>TEST</u>	<u>PAGE</u>
1a. Breaking Strength, WARP.....	1
1b. Breaking Strength, FILL.....	1
2a. Carbon Assay.....	1
2b. Hydrogen Assay.....	1
2c. Nitrogen Assay.....	1
3. Visual Inspection.....	1
4. Specific Gravity.....	1
5. pH.....	1
6. TGA.....	1
7a. Atomic Absorption.....	2
7b. Moisture Content.....	2
7c. Ash Content.....	2
8a. Filament diameter, WARP.....	2
9a. Thread Count, WARP.....	2
9b. Thread Count, FILL.....	2
10a. Areal weight.....	2
10b. Volatiles.....	2
10c. Weight Change on Acetone Wash.....	3

CHARTS

Visual Inspection.....	3A
TGA.....	6A





## FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 3 (KAISER)

1a. Breaking Strength, lbs/in, WARP ASTM D1682	PICK CENTER PLAIN AVG.	<u>#3-1E</u> 35 52 <u>53</u> 46.7
1b. Breaking Strength, lbs/in, FILL ASTM D1682	PICK CENTER PLAIN AVG.	17 25 <u>31</u> 24.3
2a. Carbon Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	99.5 99.9 <u>99.6</u> 99.67
2b. Hydrogen Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	.02 <.01 <u>&lt;.01</u> EST .007
2c. Nitrogen Assay, % MDQAI 5560	PICK CENTER PLAIN AVG.	.03 .03 <u>.05</u> EST .037
3. Visual Inspection QC1-102	See Chart 3A	
4. Specific Gravity, Units PTM-84		1.6432 1.6408 <u>1.6187</u> AVG. 1.634
5. pH, Units CTM-24B		6.4 <u>6.4</u> AVG. 6.4
6. TGA, °C at 50% Weight Loss CTM-51 (AIR)		<u>SET UP #1</u> #3-1E 949

See Chart 6A

WCA Fabric for NASA Lot# 3 (KAISER)

7a. Atomic Absorption, ppm CTM-53B		<u>#3-1E</u>
	Na	9
	K	0
	Ca	6
	Mg	3
	Li	<u>0</u>
	AVG.	18
7b. Moisture Content, % CTM-53B		.030
7c. Ash Content, % CTM-53B		.015
8a. Filament diameter, microns, WARP S.E.M. procedure (diameters are an average 10 measurements)		<u>#3-1E</u>
	AVERAGE	10.19
	Minimum	9.05
	Maximum	12.05
	Std. Dev	0.97
9a. Thread Count, per inch, WARP PTM-5A		<u>#3-1E</u>
		29
		29
		29
		29
		<u>29</u>
	AVG.	29.0
9b. Thread Count, per inch, FILL PTM-5A		22
		22
		22
		22
		<u>22</u>
	AVG.	22.0
10a. Areal weight as received, gm/4x4 PTM-3A		
	LEFT	2.495
	CENTER	2.480
	RIGHT	<u>2.506</u>
	AVG.	2.494
10b. Volatiles as received, % PTM-3A		
	LEFT	.40
	CENTER	.36
	RIGHT	<u>.40</u>
	AVG.	.39

WCA Fabric for NASA Lot# 3 (KAISER)

10c. Weight Change on Acetone Wash, %		<u>#3-1E</u>
PTM-3A	LEFT	.04
	CENTER	-.08
	RIGHT	<u>.08</u>
	AVG.	.01

U.S. Polymeric

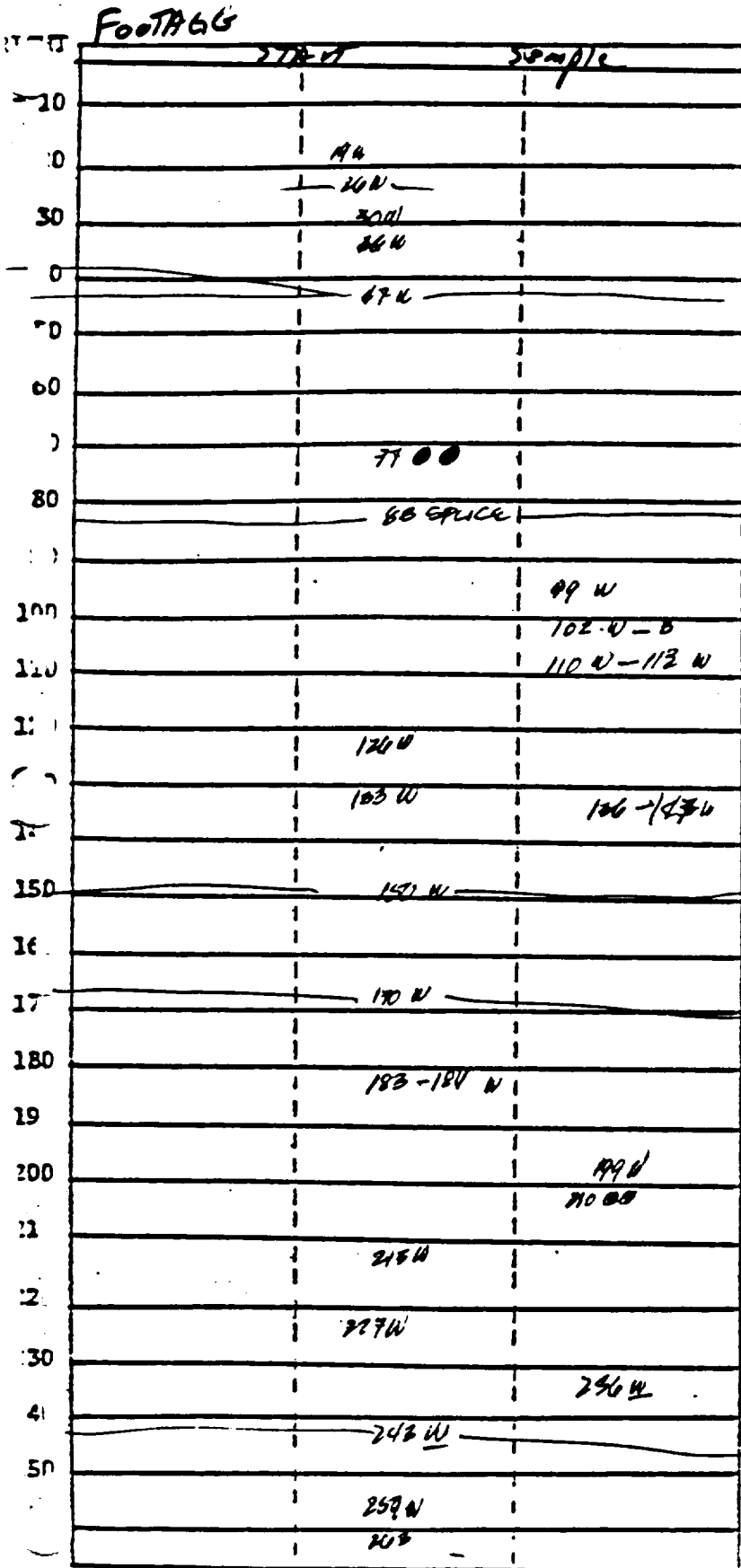


Hamid M. Quraishi, Manager  
Quality Assurance Department

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USP NO. CHART 3A

DATE 8/17/86



LEFT

TREATER OPERATOR READ UP

FABRIC WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 804 12C5 WCA-2

YARDS 180

POUNDS 100

ORDER NO. 0E71108

SPECIFICATION VARIOUS

Q.C. FILE NASA 3-1

SYMBOLS



- TEAR



- SPOTS OR STAINS



- FOLDS



- EDGE CURL



- TIGHT WEAVE OR SELVAGE



- WEAVE DISTORTION



- VISIBLE PUCKERS



- ONE PUCKER CREASING



- TWO OR MORE CREASINGS

REMARKS

272 W	260 W	450 W
282 W	364 W	452 W
290 W	266 W	452 W
296 W	374 W	459 W
304 W	377 W	451 W
309 W	391 W	464 W
313 W	400 W	472 W
320 W	404 W	475 W
334 SPICE	406 W	480 W
336 W	406 W	480 W
348 W		485 W
352 W		492 W
353 W		498 W
		510 W
		511 W
		518 W
		524 W

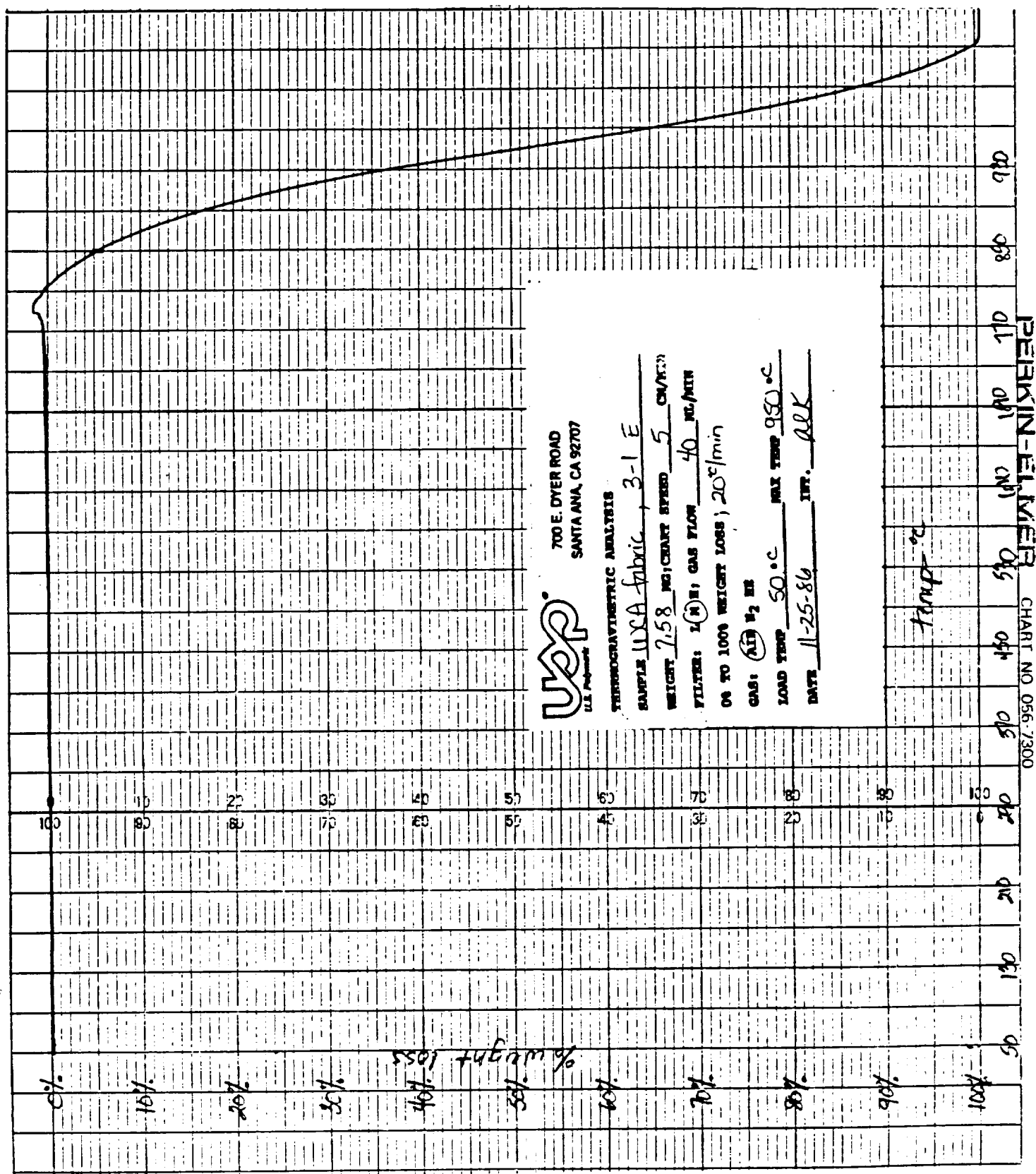
GRADE

Group C

530

END

524 W



# TABLE OF CONTENTS

## PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

<u>TEST</u>	<u>PAGE</u>
1a. Resin Content, Soxhlet.....	1
1b. Filler Content, Soxhlet.....	1
1c. Cloth Content, Soxhlet.....	1
2. Volatile Content.....	1
3. Flow.....	1
4. Resin Content, Dry Basis.....	1
5. Tack.....	1
6. Gel Time.....	1
7a. Atomic Absorption.....	1
7b. Moisture Content.....	2
7c. Ash Content.....	2
8. TGA.....	2
9. DSC.....	2
10. Infrared (IRZB) Baseline.....	2
11. Environmental History.....	2
12. Specific Gravity.....	2
13a. Tensile Strength.....	2
13b. Tensile Modulus.....	2
13c. Tensile Elongation.....	2
14a. Flexural Strength.....	3
14b. Flexural Modulus.....	3
15a. Compressive Strength.....	3
15b. Compressive Modulus.....	3
16. Double Shear Strength.....	3
17. Barcol Hardness.....	3
18. Residual Volatiles.....	3
19. Resin Content, Pyrolysis.....	3
20. Acetone Extraction.....	3
21a. CTE, with ply.....	4
21b. CTE, crossply.....	

## CHARTS

TGA.....	8A
DSC.....	9A
Infrared (IRZB) Baseline.....	10A
CTE .....	21A



## PREPREG TESTING

NAS8-36298

U.S. POLYMERIC D.E.71108

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

		ROLL#1-S
1a. Resin Content, Soxhlet, %		33.3
CTM-6D		33.9
		<u>32.7</u>
	AVG.	33.3
1b. Filler Content, Soxhlet, %		13.6
CTM-6D		13.8
		<u>13.4</u>
	AVG.	13.6
1c. Cloth Content, Soxhlet, %		53.1
CTM-6D		52.3
		<u>53.9</u>
	AVG.	53.1
2. Volatile Content, %		2.2
PTM-17B		2.0
		<u>1.8</u>
	AVG.	2.0
3. Flow, 1000 psi, %		11.8
PTM-19G		16.0
		<u>17.0</u>
	AVG.	14.9
4. Resin Content, Dry basis, %		33.8
PTM-16F, Type II		34.7
		<u>34.2</u>
	AVG.	34.2
5. Tack, lbs		15
PTM-80		
6. Gel Time, seconds		54
PTM-20E		
7a. Atomic Absorption, ppm	Na	5
CTM-53B	K	0
	Ca	0
	Mg	6
	Li	<u>0</u>
	TOTAL	11
7b. Moisture Content, %		1.76
CTM-53B		

HITCO MATERIALS DIVISION

700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5064J    NASA LOT# 3    U.S.P. LOT# C02138 (KAISER)

7c. Ash Content, % CTM-53B		<u>ROLL#1-S</u> .22
8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)	See Chart 8A	9.2
9. DSC, °C CTM-50A	First Temp See Chart 9A	180
10. Infrared (IRZB) Baseline CTM-21C	See Chart 10A	.82
11. Environmental History	Date manufactured: 2 May 1986 Packaged in: MIL-B-131 Class I bag supported in cardboard carton Date shipped: 16 June 1986 in 40°F truck	
12. Specific Gravity, Cured, Units ASTM D792		1.435 1.436 <u>1.435</u> AVG. 1.435
13a. Tensile Strength, ksi, WARP FTMS 406-1011		19.20 19.76 19.05 17.08 <u>19.50</u> AVG. 18.92
13b. Tensile Modulus, ksi, WARP FTMS 406-1011		1.77 1.85 1.96 1.93 <u>2.03</u> AVG. 1.91
13c. Tensile Elongation, %, WARP FTMS 406-1011		.84 1.40 1.28 1.13 -- AVG. 1.16
14a. Flexural Strength, ksi, WARP FTMS 406-1031		27.34 27.45 24.89 28.50 <u>27.55</u> AVG. 27.15



FM 5064J    NASA LOT# 3    U.S.P. LOT# C02138 (KAISER)

14b. Flexural Modulus, msi, WARP FTMS 406-1031	ROLL#1-S 1.49 1.60 1.55 1.78 <u>1.55</u> AVG. 1.59
15a. Compressive Strength, ksi, WARP FTMS 406-1021	19.80 19.13 15.90 20.25 <u>19.47</u> AVG. 18.91
15b. Compressive Modulus, msi, WARP FTMS 406-1021	2.20 2.29 2.21 1.93 <u>2.14</u> AVG. 2.15
16. Double Shear Strength, ksi FTMS 406-1041A	2.79 2.81 2.75 2.76 <u>2.56</u> AVG. 2.73
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	61.9
18. Residual Volatiles, % PTM-98	.83 .90 <u>1.08</u> AVG. .93
19. Resin Content, Pyrolysis, % CTM-14B	30.06 31.20 <u>30.14</u> AVG. 30.47
20. Acetone Extraction, % CTM-18A	3.22 3.40 <u>4.04</u> AVG. 3.56
21a. CTE, in/in °F with PLY PTM-61B	4.04 <u>2.06</u> AVG. 3.05


FM 5064J    NASA LOT# 3    U.S.P. LOT# C02138 (KAISER)

21b. CTE, 1n/1n   •F Cross PLY  
PTM-61B

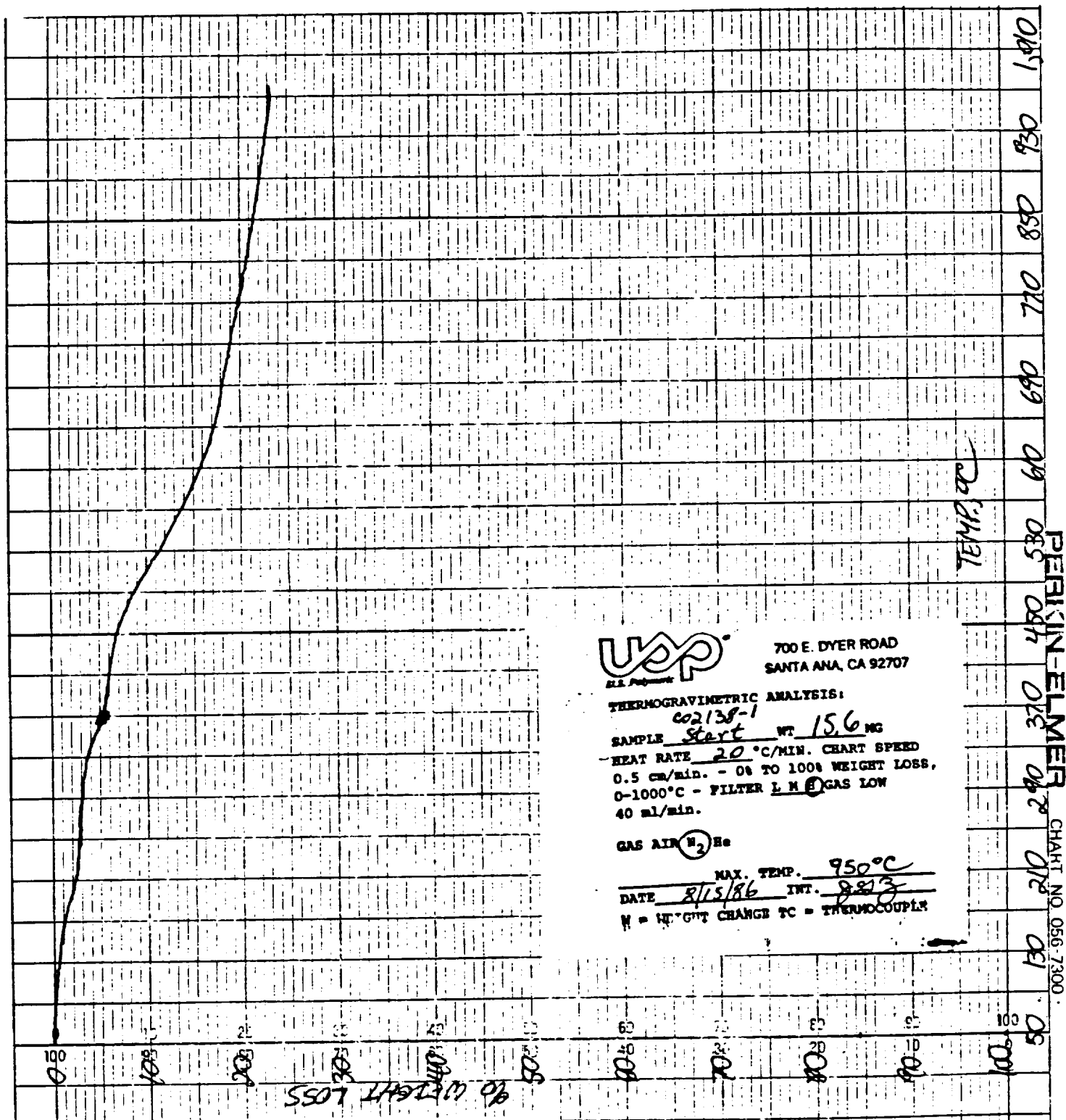
	8.29
	<u>13.37</u>
AVG.	10.83

See Chart 21A

U.S. Polymeric

  
Hamid M. Quraishi, Manager  
Quality Assurance Department

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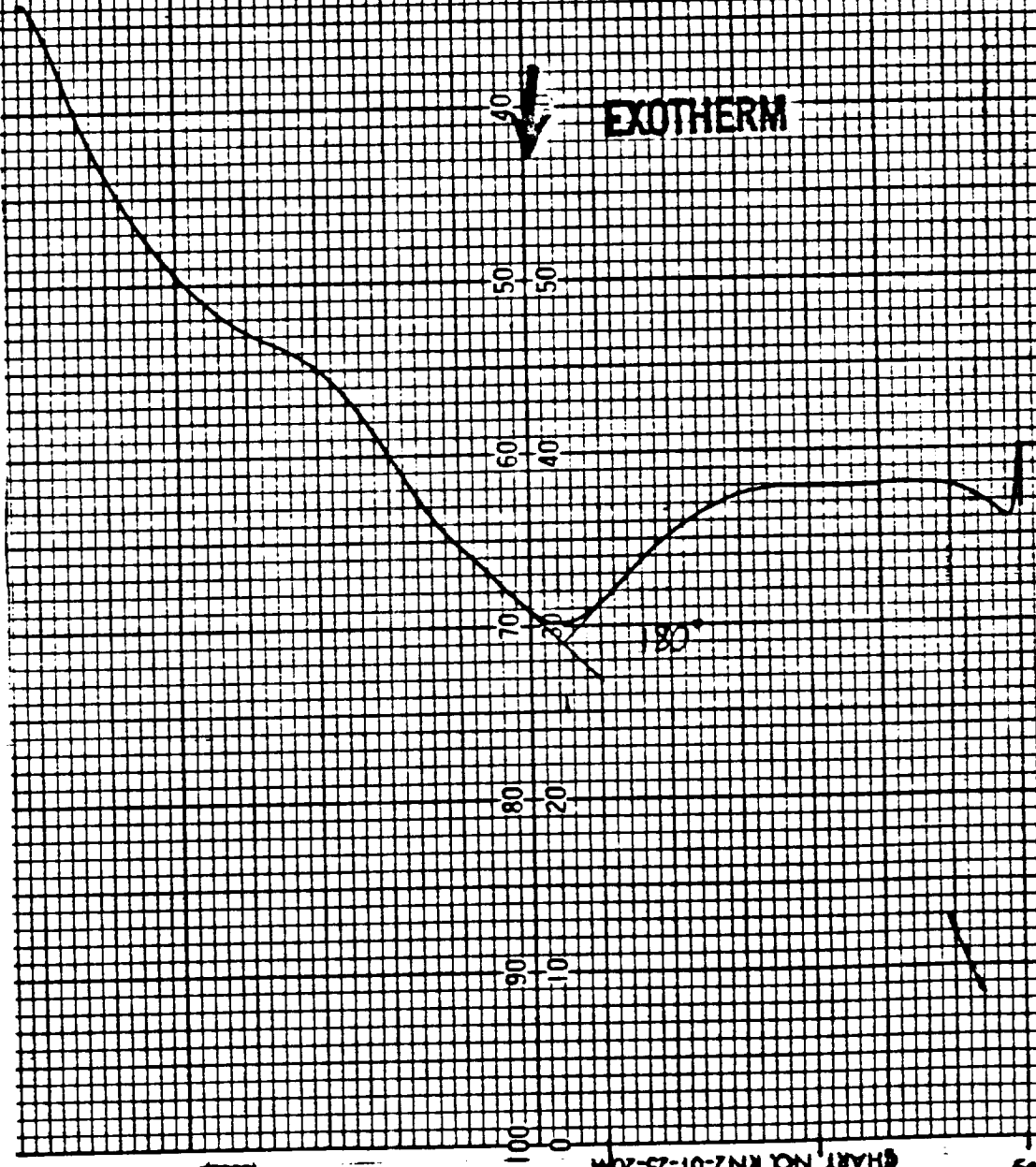
## U.S. POLYMERIC DSC-2

Sample C02198 - 1.51045 g Wt. 19.14 mg  
Heat Rate: 20 °C/min Range 2.0 mW/sec  
Recorder Span: 50 mV Chart speed 10 mm/min  
Temp Limits: Lower 50 °C Upper 350 °C  
Heating Mode: Auto Cool/Cycle Cooling Rate 10 °C/min  
Operator A.K. Date 9-17-86

9-15-86 LAST CALIBRATION DATE

5 °C CALIBRATION DELTA °C

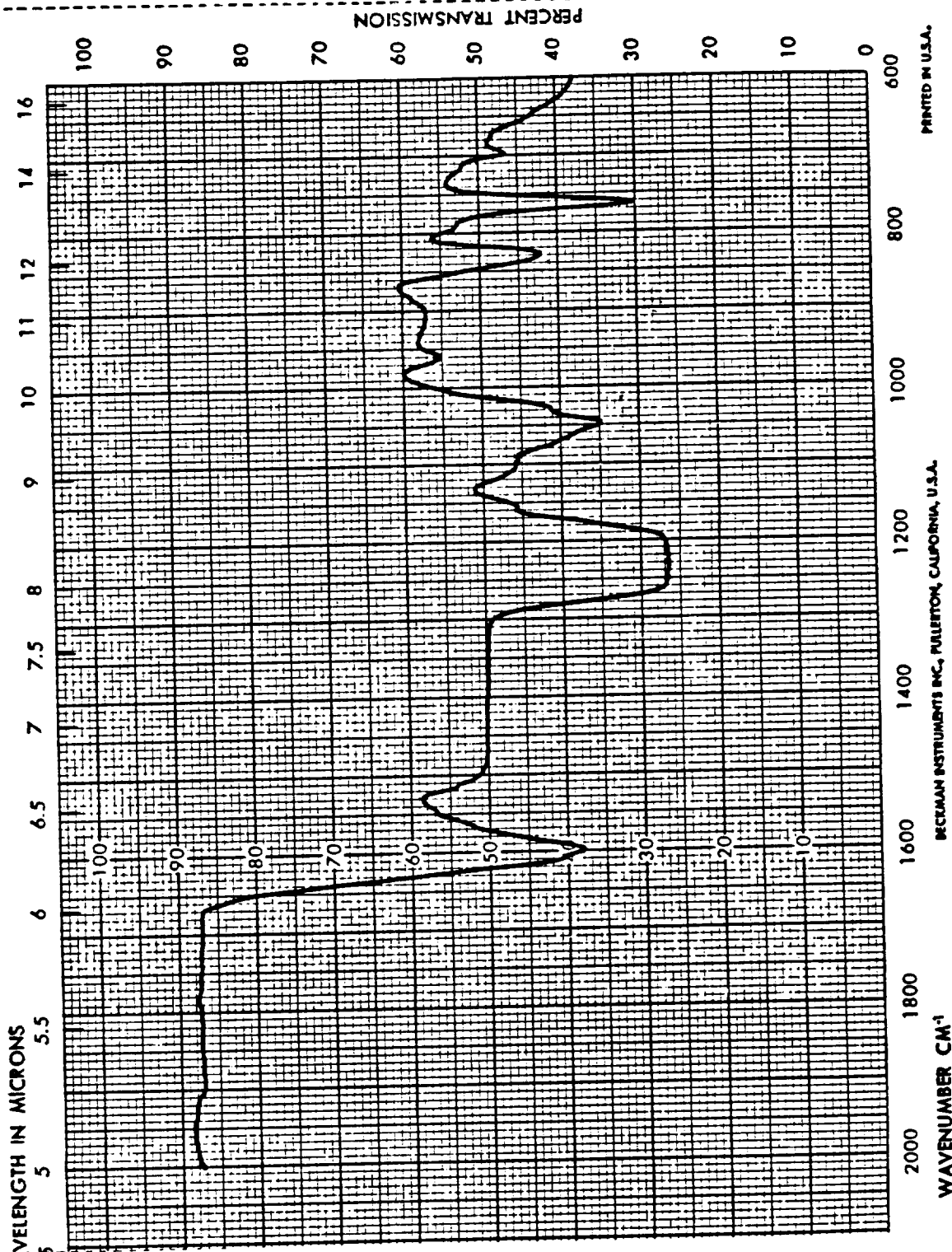
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(6002)

CHART NO. R2-01-25-20M

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SPECTRUM NO. 15187  
 DATE 7-07-86  
 SAMPLE FM 5064 J  
CO2138 # 1  
 SOURCE \_\_\_\_\_  
 STRUCTURE \_\_\_\_\_  
 PATH 0.2 mm NaCl  
 SOLVENT ACETONE  
 CONCENTRATION 30-50%  
 PHASE 3  
 COMMENTS PRE-PRG  
MATERIAL  
 ANALYST V. MURANDA

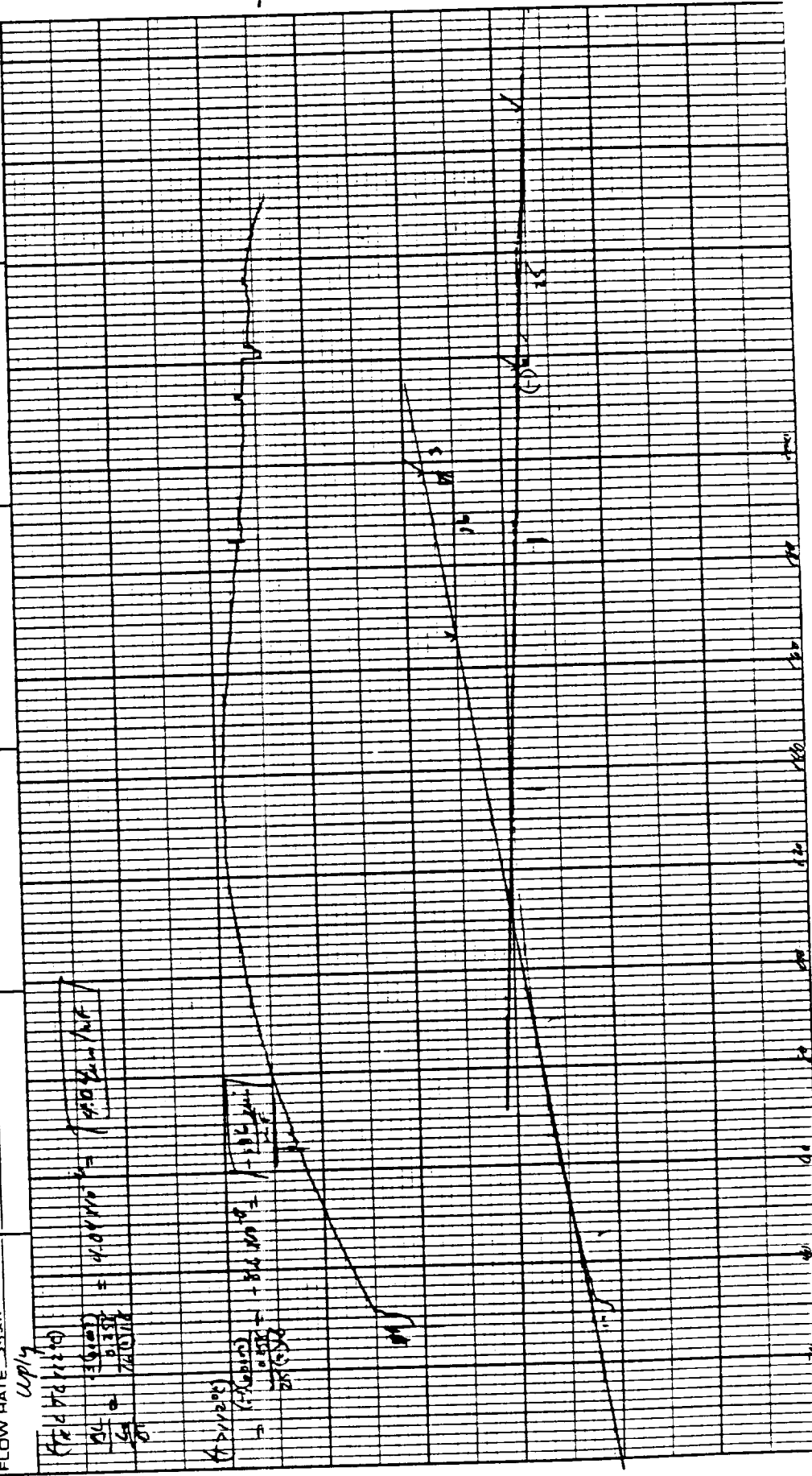
**Beckman®**

INFRARED  
SPECTROPHOTOMETER

BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.

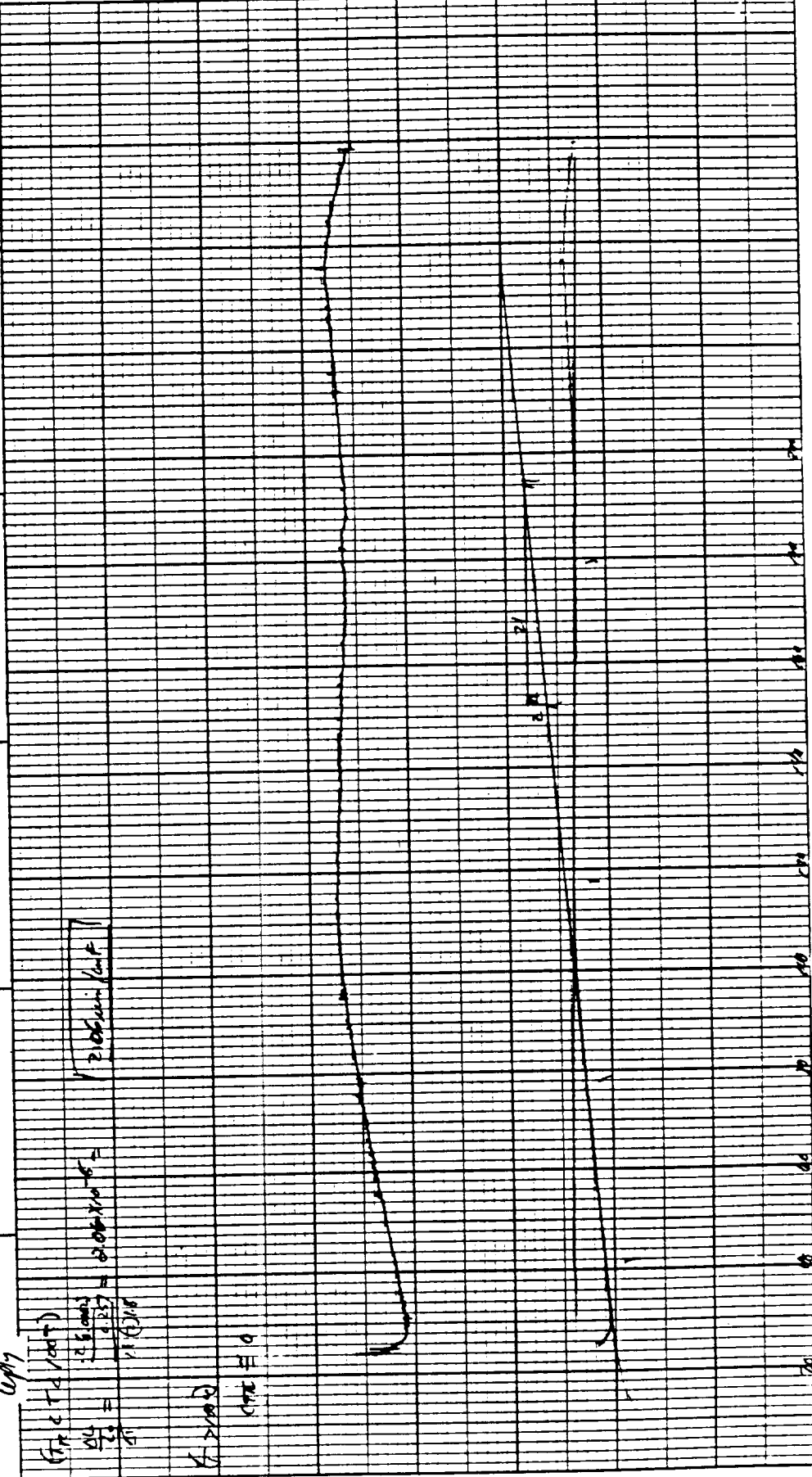
PRINTED IN U.S.A.

RUN NO. <u>1218</u> OPERATOR <u>TR</u> SAMPLE <u>C02137-1-5 mg (1)</u> ATM <u>42</u> @ <u>500</u>	<u>T-AXIS</u> SCALE: °C/in <u>50</u> <u>20</u> PROG RATE: °C/min <u>0</u> HEAT <input checked="" type="checkbox"/> COOL <u>ISO</u> SHIFT: in <u>0</u>	<u>DTA-DSC</u> SCALE: °C/in _____ (mcal/sec)/in _____ WEIGHT: mg _____ REFERENCE _____	<u>TGA</u> SCALE: mg/in _____ SUPPRESSION: mg _____ WEIGHT: mg _____ TIME CONST.: sec _____ dY: (mg/min) /in _____	<u>TMA</u> SCALE: mile/in <u>0.1/0.4</u> MODE <u>Load/strain</u> SAMPLE SIZE <u>0.258</u> LOAD: g <u>11</u> dY: (10X) (mile/min) /in _____
--	---	--	---	---



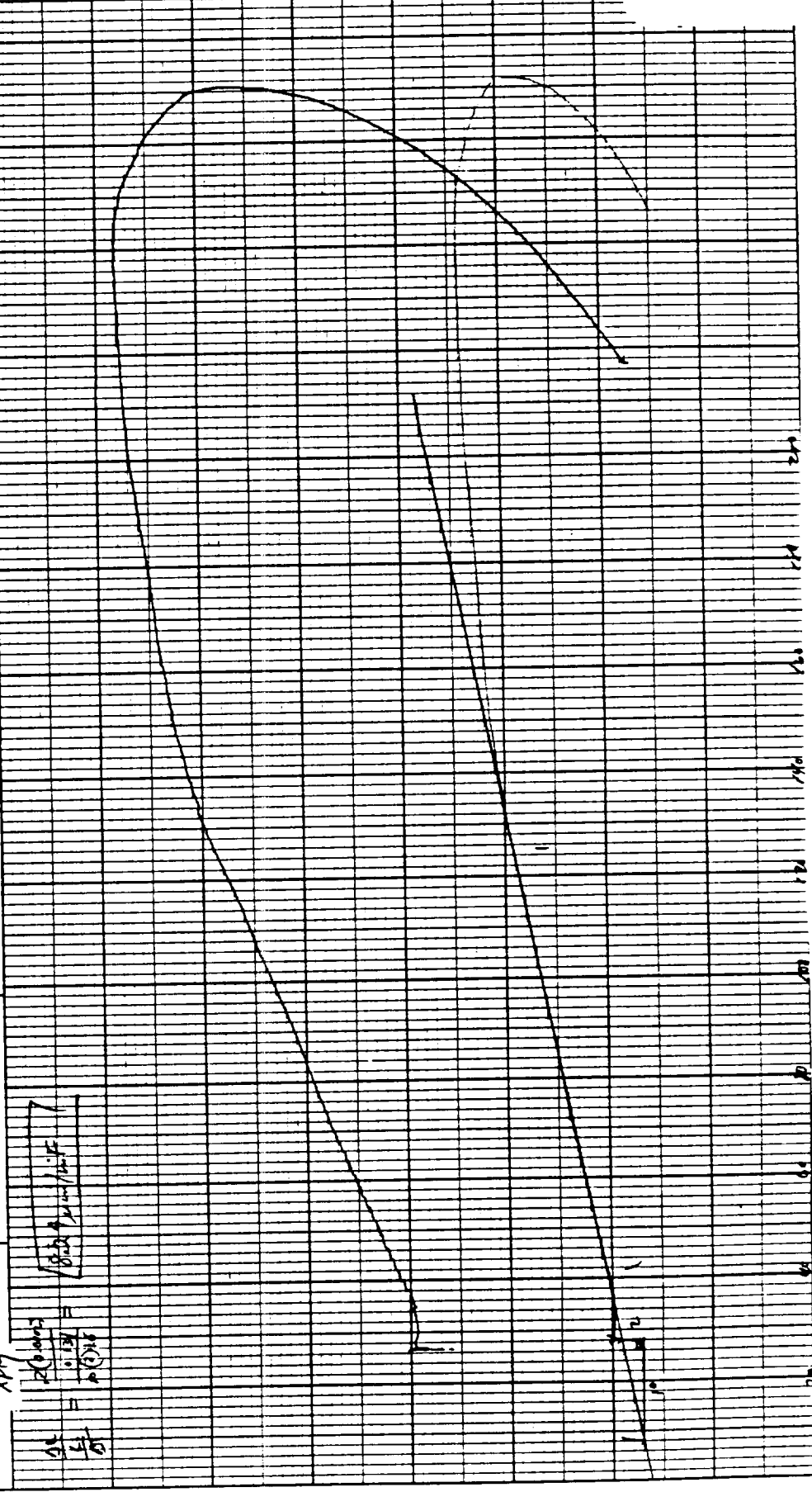
PART NO. 990088

RUN NO. <u>DATE 9/20/79</u> OPERATOR <u>TJ</u> SAMPLE <u>CO 2138 - 1 - SPART - (2)</u> ATM. <u>Atk</u> <u>0 JTP</u> FLOW RATE <u>353 cc/h</u>		T-AXIS SCALE, °C/in. <u>20</u> PROG. RATE, °C/min. <u>0</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT, in. <u>0</u>		DTA/DSC SCALE, °C/in. <u>(mcal/sec)/in.</u> WEIGHT, mg <u>REFERENCE</u>		TGA SCALE, mg/in. <u>20</u> SUPPRESSION, mg <u>0</u> WEIGHT, mg <u>0</u> TIME CONST., sec <u>0</u> dY, (mg/min)/in. <u>0</u>		TMA SCALE, mils/in. <u>0.100</u> MODE <u>Extension</u> SAMPLE SIZE <u>0.257</u> LOAD, g <u>0</u> dY, (10X) (mils/min)/in. <u>0</u>	
---	--	---	--	---	--	---	--	---	--



PART NO. 990088

<b>Run No.</b> _____ <b>Date</b> 7/1/80 <b>Operator</b> TA <b>Sample</b> Co 2138-1-5045-(4) <b>ATM.</b> Air @ 300 SEP <b>Flow Rate</b> 3-5500	<b>T-AXIS</b> <b>SCALE:</b> °C/in 50/20 <b>PROG. RATE:</b> °C/min 10 <b>HEAT / COOL</b> / ISO <b>SHIFT:</b> in 0	<b>DTA-DSC</b> <b>SCALE:</b> °C/in (mcal/sec)/in <b>WEIGHT:</b> mg <b>REFERENCE</b>	<b>TGA</b> <b>SCALE:</b> mg/in <b>SUPPRESSION:</b> mg <b>WEIGHT:</b> mg <b>TIME CONST.:</b> sec <b>dY:</b> (mg/min)/in	<b>TMA</b> <b>SCALE:</b> mils/in 0.1/0.2 <b>MODE:</b> (mils/min) <b>SAMPLE SIZE:</b> 0.134 <b>LOAD:</b> g 10 <b>dY:</b> (10X) (mils/min)/in
--	--	--	---	--



DU PONT Instruments

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MEASURED VARIABLE



PART NO. 990088

RUN NO. DATE 9/15/84  
OPERATOR: DJ  
SAMPLE: C02138-1-START-(5)  
ATM: ATM @ JTR  
FLOW RATE 2-55 L/min

T-AXIS  
SCALE: °C/in 30-24  
PROG RATE: °C/min 10  
HEAT / COOL ISO  
SHIFT: in 0

DTA-DSC  
SCALE: °C/in  
(mcal/sec)/in  
WEIGHT: mg  
REFERENCE

TGA  
SCALE: mg/in  
SUPPRESSION: mg  
WEIGHT: mg  
TIME CONST: sec  
dY: (mg/min)/in

TMA  
SCALE: mils/in 0-10.2  
MODE: EXTENDED  
SAMPLE SIZE: 0.134  
LOAD: g 10  
dY: (10X) (mils/min)/in

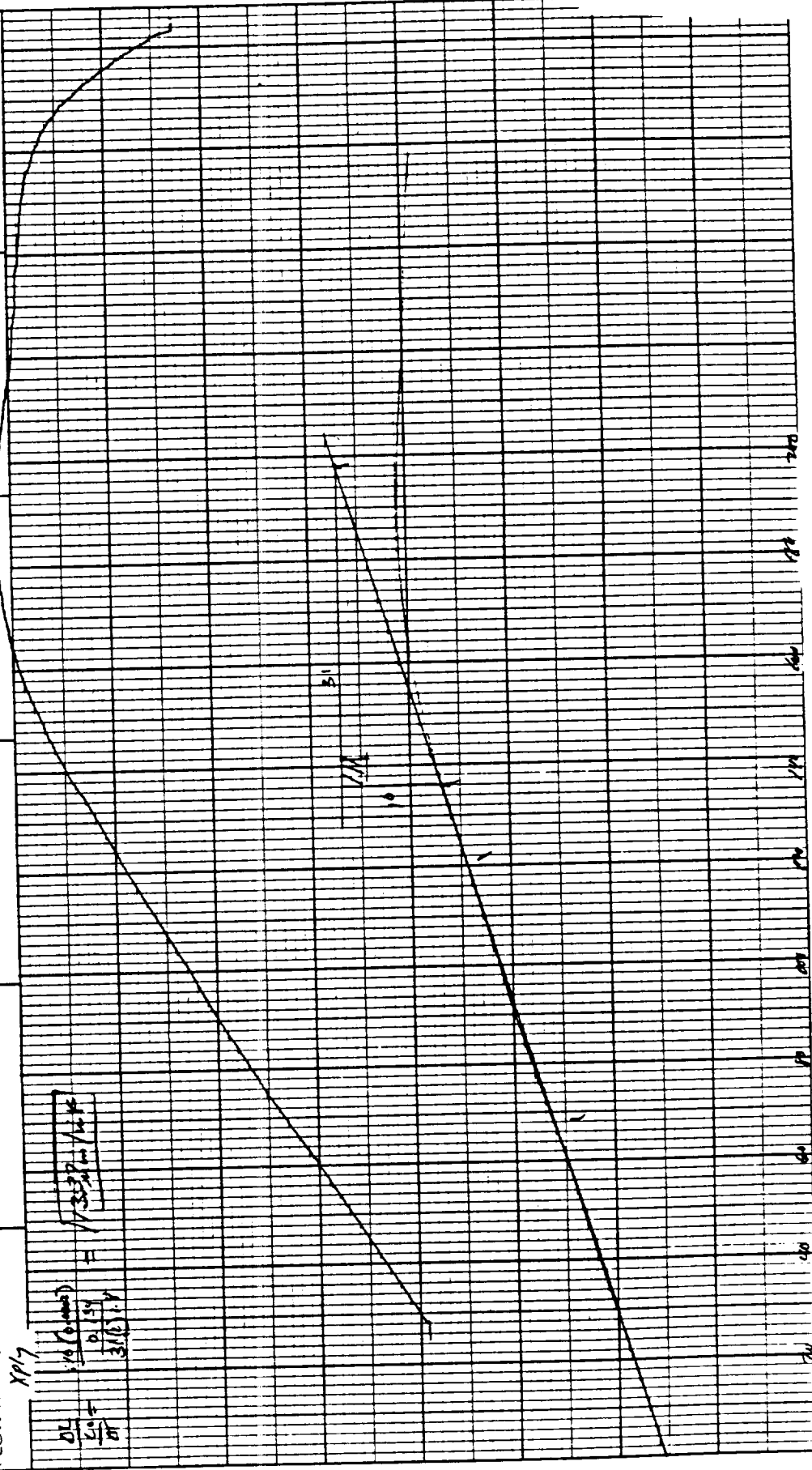


TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 4

<u>TEST</u>	<u>PAGE</u>
1. Carbon Content.....	1
2. Ash Content.....	1
3. Atomic Absorption.....	1
3a. Moisture Content.....	1
3b. Ash Content.....	1
4. pH.....	1
5. Particle Size, S.E.M. procedure.....	1
6a. TGA, °C at 50% Loss.....	1
6b. TGA.....	2
7. Particle Size Distribution.....	2
7a. Particle Size, Horiba.....	2

CHARTS

TGA.....	6A - 6C
Particle Size Distribution.....	7A - 7C



## FILLER TESTING

NASA-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 4

1. Carbon Content, % QAI-5560	<u>SAMPLE</u>			
	<u>#4-1</u>	<u>#4-2</u>	<u>#4-3</u>	
	99.75	99.57	99.17	
	NASA LOT# 4 AVERAGE			99.50
2. Ash Content, % PTM-71B	<u>.005</u>	<u>.000</u>	<u>.010</u>	
	<u>.021</u>	<u>.015</u>	<u>.005</u>	
	AVG. .013	.008	.008	
	NASA LOT# 4 AVERAGE			.010
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)	<u>#4-1</u>	<u>#4-2</u>	<u>#4-3</u>	<u>LOT#4</u>
				<u>AVG.</u>
	Na 2.0	2.0	1.0	1.7
	K 1.5	2.0	1.0	1.5
	Ca 1.5	0.5	1.5	1.2
	Mg 1.0	1.0	0.0	0.7
	Li 0.0	0.0	0.0	0.0
	TOTAL 6.0	5.5	3.5	5.0
3a. Moisture Content, % CTM-53B	<u>0.018</u>	<u>0.005</u>	<u>0.010</u>	
	<u>0.030</u>	<u>0.015</u>	<u>0.015</u>	
	AVG. 0.024	0.010	0.013	
	NASA LOT# 4 AVERAGE			0.016
3b. Ash Content, % CTM-53B	<u>0.005</u>	<u>0.005</u>	<u>0.000</u>	
	<u>0.000</u>	<u>0.005</u>	<u>0.000</u>	
	AVG. 0.003	0.005	0.000	
	NASA LOT# 4 AVERAGE			0.003
4. pH, Units ASTM D1512	<u>4.70</u>	<u>4.80</u>	<u>4.80</u>	
	<u>4.80</u>	<u>4.85</u>	<u>4.65</u>	
	AVG. 4.75	4.82	4.72	
	NASA LOT# 4 AVERAGE			4.76
5. Particle Size, microns S.E.M. procedure (Average values are of 10 determinations)	AVG. .42	.38	.43	
	Maximum .56	.73	.70	
	Minimum .20	.20	.23	
	Std. Dev .08	.05	.08	
	NASA LOT# 4 AVERAGE SIZE			.41
6a. TGA, °C at 50% Loss CTM-51	<u>701</u>	<u>688</u>	<u>697</u>	
	NASA LOT# 4 AVERAGE			695

Filler Lot for NASA Lot# 4

6b. TGA  
CTM-51

See Charts 6A-6C

7. Particle Size Distribution  
CTM-72

See Charts 7A-7C

7a. Particle Size, microns  
CTM-72

	<u>#4-1</u>	<u>#4-2</u>	<u>#4-3</u>
	.94	.79	.98
	<u>.94</u>	<u>.82</u>	<u>.91</u>
AVG.	.94	.80	.94
NASA LOT# 4	AVERAGE		.89

U.S. Polymeric



Hamid M. Quraishi, Manager  
Quality Assurance Department

Figure #4

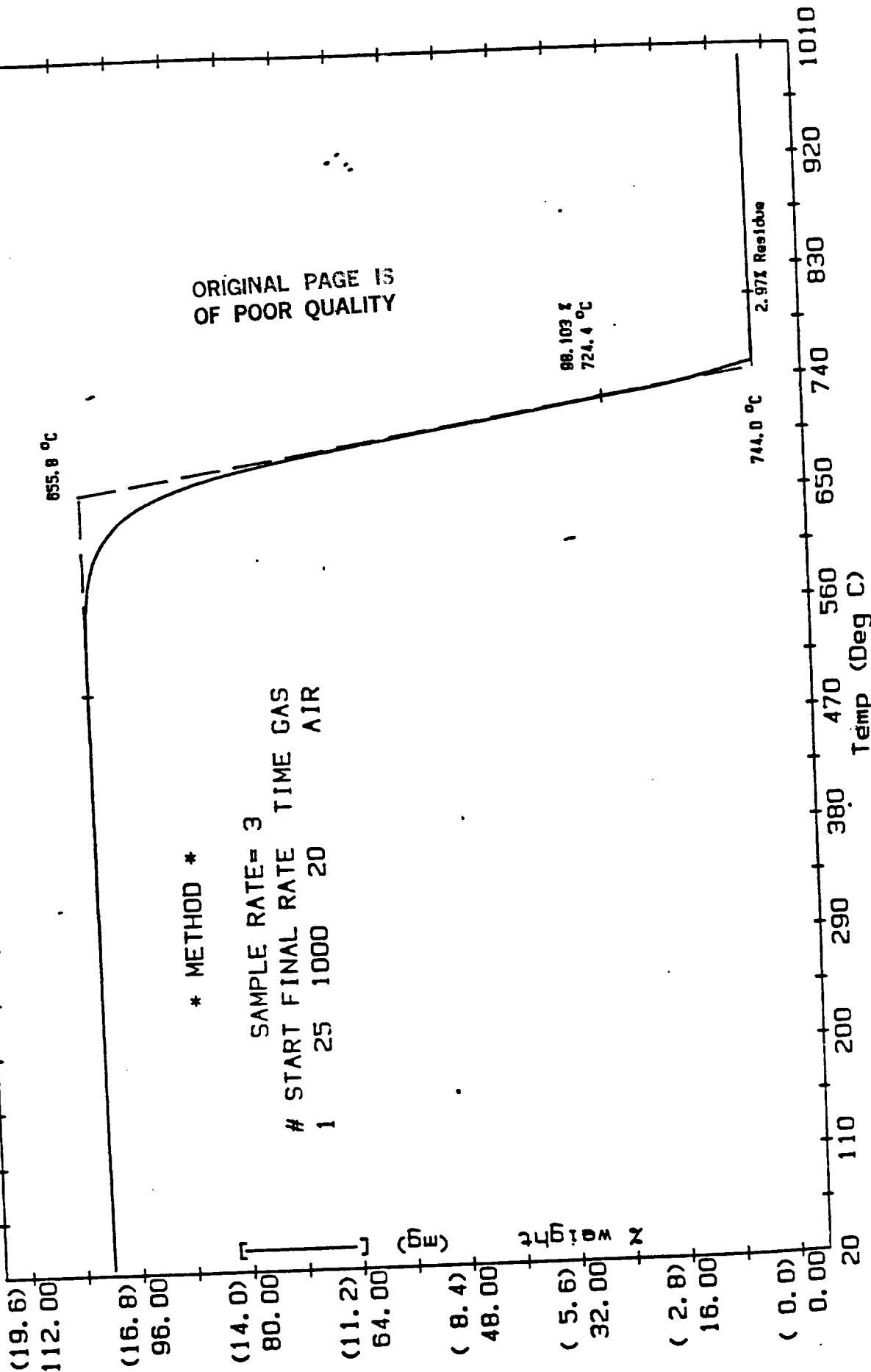
CHART 6A

Operator: M. WEGENER  
Disk ID: DATA DISK #93  
File No: D 44.DAT V2.1  
Plotted: FEB/04/86 10:23

# TGA

OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL

Sample: 4-1  
Size: 17.543 mg  
Run No: MIR #12831 (12)  
Date: FEB/04/86 07:06



ANALYTICAL LABORATORY SERVICES

Beckman Industrial

Operator: M. WEGENER  
 Disk ID: DATA DISK #93  
 File No: D 45.DAT V2.1  
 Plotted: FEB/04/86 10:54

# TGA

OMNITHERM DATA SYSTEM  
 BECKMAN INDUSTRIAL

Sample: 4-2  
 Size: 19.186 mg  
 Run No: MIR #12831 (12)  
 Date: FEB/04/86 08:21

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\* METHOD \*

SAMPLE RATE= 3  
 # START FINAL RATE TIME GAS  
 1 25 1000 20 AIR

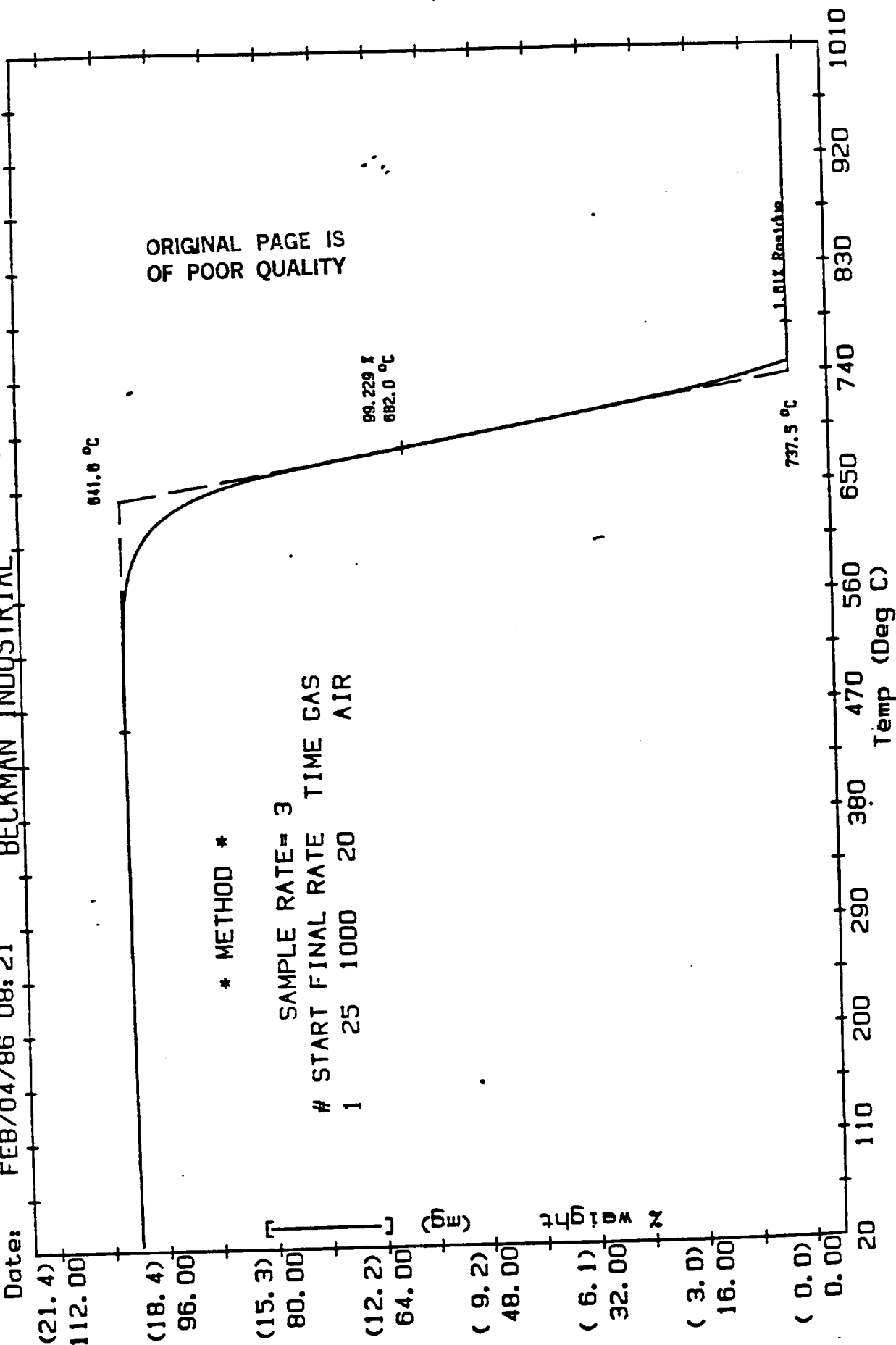
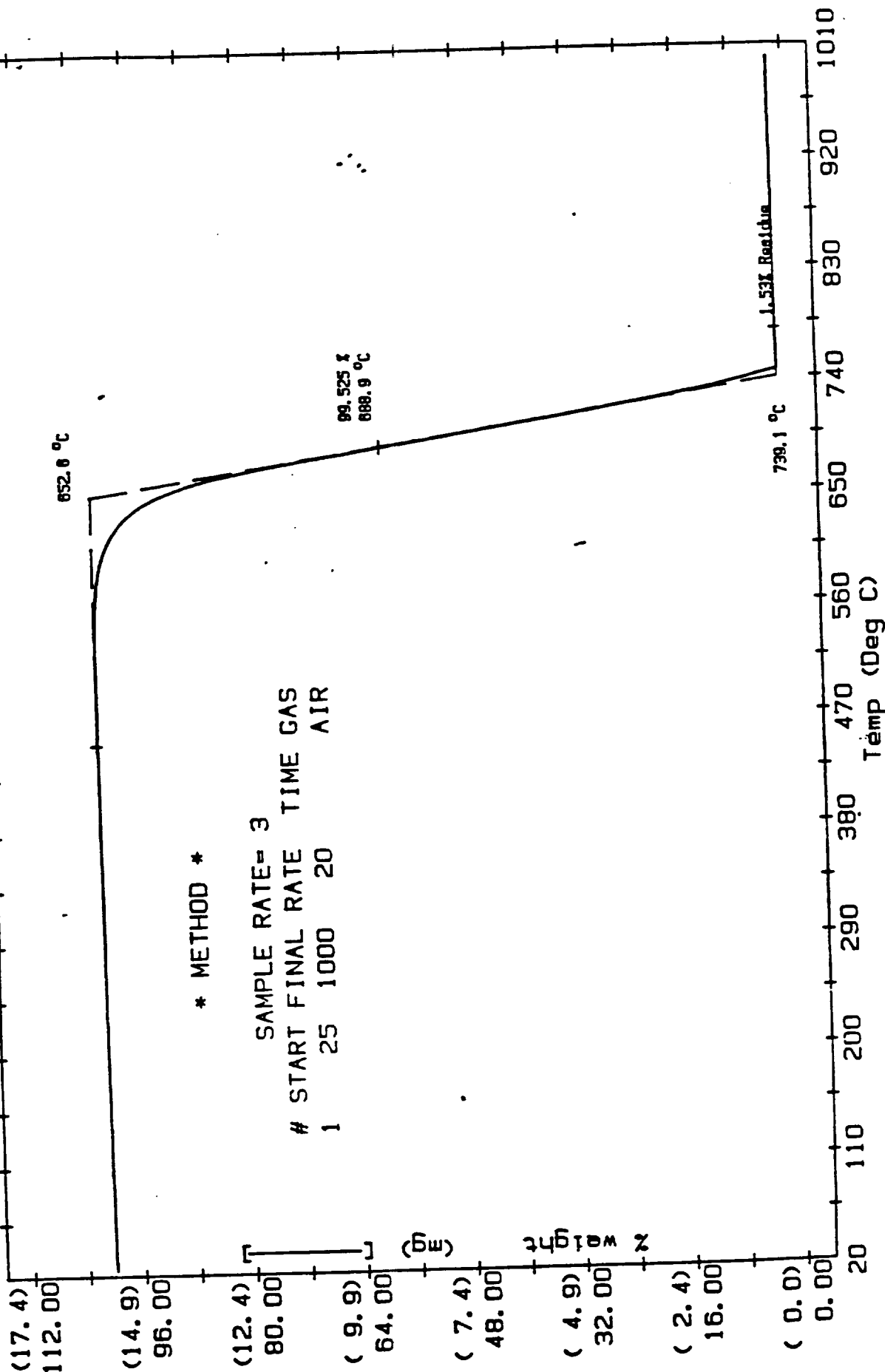


FIGURE #4

CHART 6C

Sample: 4-3  
 Size: 15.594 mg  
 Run No: MIR #12831 (12)  
 Date: FEB/04/86 10:14  
 Operator: M. WEGENER  
 Disk ID: DATA DISK #93  
 File No: D 46.DAT V2.1  
 Plotted: FEB/04/86 11:43  
**TGA**  
 OMNITHERM DATA SYSTEM  
 BECKMAN INDUSTRIAL



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CHART 7A

\* DISTRIBUTION TABLE (BY VOL.)

HOP18A CAPA-500  
PARTICLE ANALYZER

DATE 5-27-86  
SAMPLE NASA LOT#4-1  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml  
#2

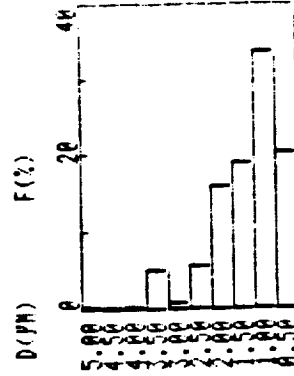
\* CONDITIONS

SOLV.VISC 19.90(CP)  
SOLV.DENS 1.11(G/CC)  
SAMP.DENS 1.90(G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01(PM)  
D(DIV) 0.50(PM)

SPEED 5000. (RPM)

D(AVE) 0.94 (PM)

\* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-1  
Sample #2

\* DISTRIBUTION TABLE (BY VOL.)

HOP18A CAPA-500  
PARTICLE ANALYZER

DATE 5-27-86  
SAMPLE NASA LOT#4-1  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml  
#1

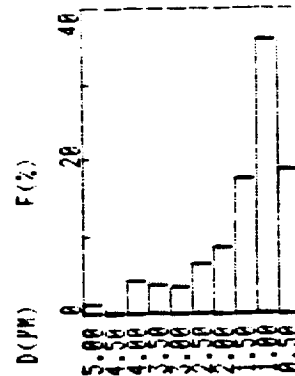
\* CONDITIONS

SOLV.VISC 19.90(CP)  
SOLV.DENS 1.11(G/CC)  
SAMP.DENS 1.90(G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01(PM)  
D(DIV) 0.50(PM)

SPEED 5000. (RPM)

D(AVE) 0.94 (PM)

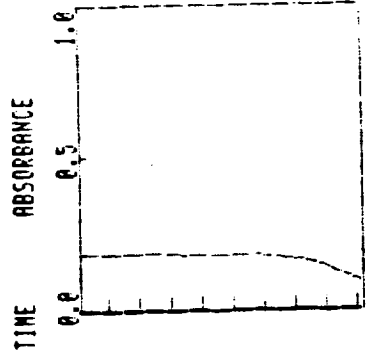
\* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-1  
Sample #1

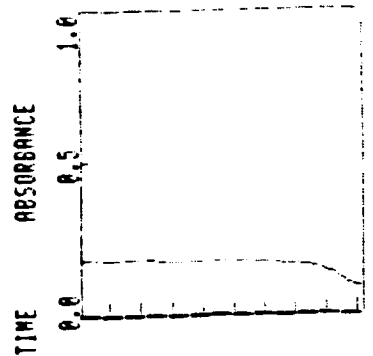
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\* DATA



\* TIME 0 H 11 MIN 31 SEC

\* DATA

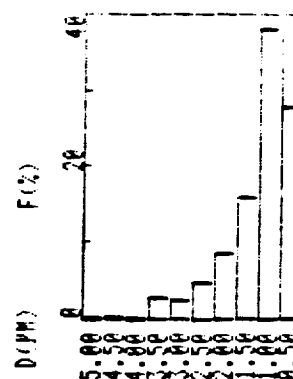




## \* DISTRIBUTION TABLE (BY VOL.)

D (µM)	F (%)	P (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	2.7	2.7
3.00-2.50	2.4	5.1
2.50-2.00	4.7	9.8
2.00-1.50	8.4	18.2
1.50-1.00	15.7	33.9
1.00-0.50	38.1	72.0
0.50-0.00	28.0	100.0
D(AVE)	0.79 (µM)	

## \* DISTRIBUTION GRAPH (BY VOL.)

Lot#4-2  
Sample#1

HOPICA CAPA-500

## PARTICLE ANALYZER

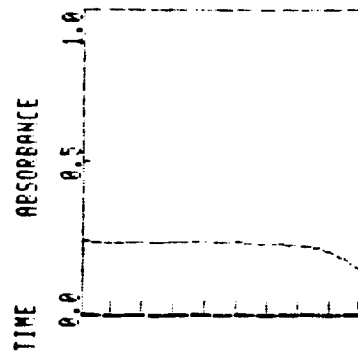
DATE 5-27-86  
#1 SAMPLE NASA Lot#4-2  
SOLVENT Ethyl Glycol  
C=0.01mg/ml

## \* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D (MAX) 5.0 (µM)  
D (MIN) 0.01 (µM)  
D (DIV) 0.50 (µM)  
SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

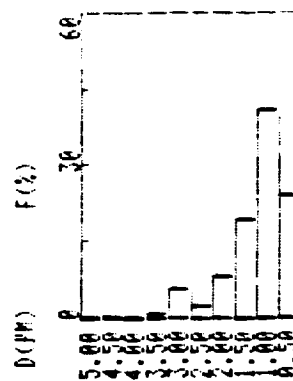
## \* DATA



## \* DISTRIBUTION TABLE (BY VOL.)

D (µM)	F (%)	P (%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.7	0.7
3.00-2.50	5.5	6.2
2.50-2.00	2.2	8.4
2.00-1.50	7.9	16.3
1.50-1.00	19.2	35.5
1.00-0.50	41.1	76.5
0.50-0.00	23.5	100.0
D(AVE)	0.82 (µM)	

## \* DISTRIBUTION GRAPH (BY VOL.)

Lot#4-2  
Sample#2

HOPICA CAPA-500

## PARTICLE ANALYZER

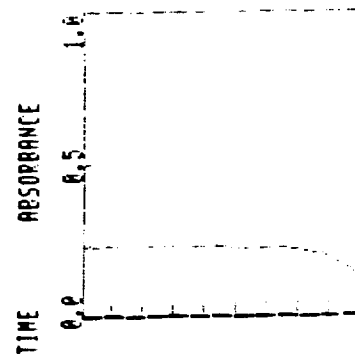
DATE 5-27-86  
#2 SAMPLE NASA Lot#4-2  
SOLVENT Ethyl Glycol  
C=0.01mg/ml

## \* CONDITIONS

SOLV. VISC 19.90 (CP)  
SOLV. DENS 1.11 (G/CC)  
SAMP. DENS 1.90 (G/CC)  
D (MAX) 5.0 (µM)  
D (MIN) 0.01 (µM)  
D (DIV) 0.50 (µM)  
SPEED 5000. (RPM)

\* TIME 0 H 11 MIN 31 SEC

## \* DATA

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CHART 7C

\* DISTRIBUTION TABLE (BY VOL.)

HORIBA CAPA-500  
PARTICLE ANALYZER

DATE 5-2-86  
SAMPLE NASA Lot#43  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml  
#2

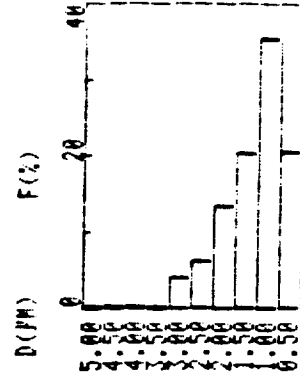
\* CONDITIONS

SOLV.VISC 19.90(CP)  
SOLV.DENS 1.11(G/CC)  
SAMP.DENS 1.90(G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01(PM)  
D(DIV) 0.50(PM)

SPEED 5000. (PPH)

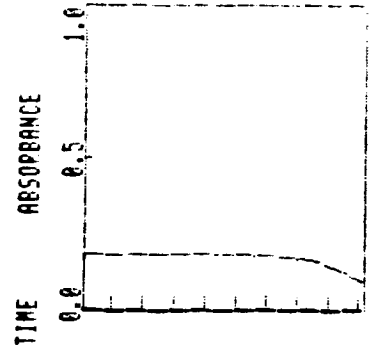
D(AVE) 0.91 (PM)

\* DISTRIBUTION GRAPH (BY VOL.)



\* TIME 0 H 11 MIN 31 SEC

\* DATA



\* DISTRIBUTION TABLE (BY VOL.)

HORIBA CAPA-500  
PARTICLE ANALYZER

DATE 5-2-86  
SAMPLE NASA Lot#43  
SOLVENT ETHYL GLYCOL  
C=0.01 mg/ml  
#1

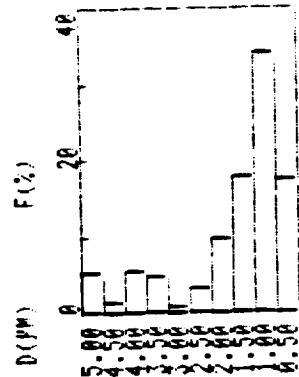
\* CONDITIONS

SOLV.VISC 19.90(CP)  
SOLV.DENS 1.11(G/CC)  
SAMP.DENS 1.90(G/CC)  
D(MAX) 5.0 (PM)  
D(MIN) 0.01(PM)  
D(DIV) 0.50(PM)

SPEED 5000. (PPH)

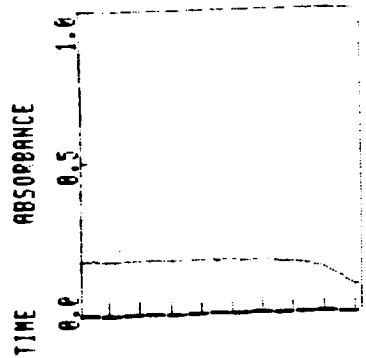
D(AVE) 0.98 (PM)

\* DISTRIBUTION GRAPH (BY VOL.)



\* TIME 0 H 11 MIN 31 SEC

\* DATA



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NAS8-36298

U.S. Polymeric O.E. 71108

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7. TGA.....	1
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10. GPC.....	1
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12. Phenol Content.....	2
13. Chang's Index.....	2
14. RDS.....	2
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## RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 4

1. Resin Solids, % PTM-7C	#4-1	#4-2	
	83.0	82.8	
	83.6	83.2	
	<u>82.4</u>	<u>83.5</u>	
	AVG. 83.0	83.2	
	Lot# 4	AVERAGE	83.1
2. Specific Gravity @ 25°C PTM-29C	1.167	1.169	
	Lot# 4	AVERAGE	1.168
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C	13,750	13,500	
	Lot# 4	AVERAGE	13,625
4. Gel Time, min:sec PTM-47B	4:15	4:05	
	Lot# 4	AVERAGE	4:10
5. Atomic Absorption, ppm CTM-53B (Values are averages of two determinations)	#4-1	#4-2	<u>LOT4 AVG</u>
	Na 91.0	100.0	95.5
	K 3.0	3.0	3.0
	Ca 12.5	14.5	13.5
	Mg 4.0	3.5	3.8
	Li <u>0.0</u>	<u>0.0</u>	<u>0.0</u>
	AVG. 110.5	121.0	115.8
6. Volatiles, Gas Chromatography CTM-55	See Charts 6A-6B		
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	42.8	42.5	
	Lot# 4	AVERAGE	42.7
	See Chart 7A-7B		
8. DSC, temperature °C CTM-50A	186	188	
	Lot# 4	AVERAGE	187
	See Chart 8A-8B		
	See Chart 9A-9B		
9. HPLC CTM-49A			
10. GPC, Average molecular wt. CTM-49A	1679	1577	
	Lot# 4	AVERAGE	1628

See Chart 10A-10B

USP-39A Resin Lot for NASA Lot# 4

11. pH, units CTM-1B	<u>#4-1</u>	<u>#4-2</u>
	8.18	8.20
	Lot# 4	AVERAGE 8.19
12. Phenol Content, % CTM-55 Appendix 1	12.83	12.93
	<u>12.55</u>	<u>12.84</u>
	AVG. 12.69	12.88
	Lot# 4	AVERAGE 12.79
13. Chang's Index, ml. CTM-5B	24.9	24.6
	Lot# 4	AVERAGE 24.8
14. RDS, Minimum Viscosity, cps. CTM-57A	<u>Min. Visc.</u>	<u>°C</u>
	#4-1 148	106
	#4-2 143	106
	AVG. 145	106
	See Charts 14A-14B	
15. NMR Vendor procedure	See Charts 15A-15B	

U. S. Polymeric

*Hamid M. Quraishi*  
 Hamid M. Quraishi, Manager  
 Quality Assurance Department

# TYPICAL GAS CHROMATOGRAPH SET-UP

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Operator <u>J. J. J.</u>	Date <u>12/16/86</u>
Column <u>632</u>	Detector <u>FID</u>
Length <u>114 m</u>	Voltage <u>        </u>
Dia. <u>1/4 mm</u>	Sensit. <u>        </u>
Liquid Phase <u>AT-1000</u>	Flow Rates, ml/min
Wt. % <u>0.1</u>	Hydrogen <u>60</u> Air <u>96</u>
Support <u>GRAPH-PAC</u>	Scavenge <u>        </u>
Mesh <u>80/100</u>	Split <u>        </u>
Carrier Gas <u>He</u>	Temperature, °C
Rotameter <u>        </u>	Det. <u>220</u> Inj. <u>200</u>
Inlet Press <u>60</u> psig	Column Initial <u>60</u>
Rate <u>30</u> ml/min	Final <u>2/0</u>
CHART SPEED <u>        </u>	Rate <u>500</u> MIN
SAMPLE <u>USP39A, 4</u>	Solvent <u>THF</u>
Size <u>0.05 ul</u>	Concn. <u>0.11631 gm/ml</u>

## GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

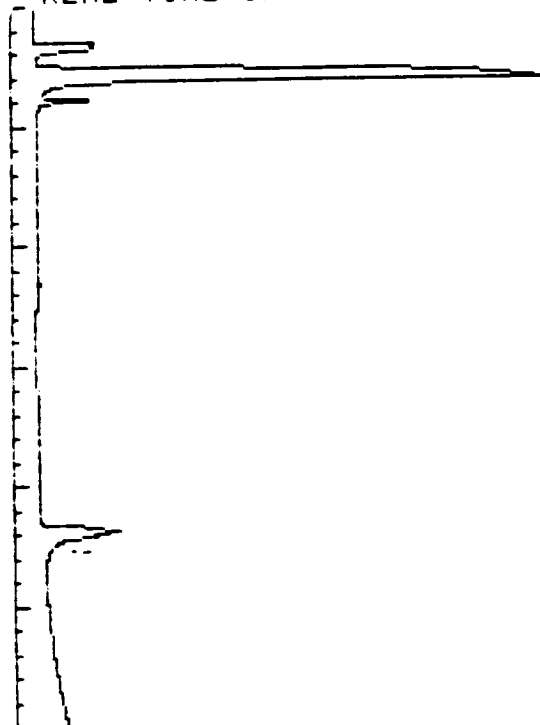
### STANDARD SOLVENT/MONOMER

### RETENTION TIME (MINS.)

MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

## REAL TIME CHROMATOGRAM \*\*\*



FINAL FULL SCALE MV =1000.00

SAMPLE: USP39A 4-1  
 MISC.: C=0.11631 GMS/ML

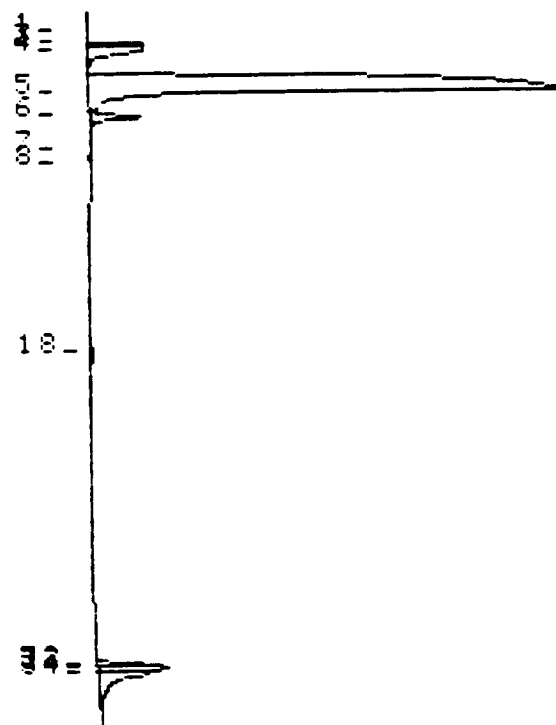
TIME: 12:34  
 DATE: 12/16/86  
 OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
 DELAY TIME: 0.00  
 CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
1	.67	1162	.029	1	191
3	1.60	76625	1.922	2	11349
4	1.80	191960	4.815	2	11360
5	3.20	3118800	78.236	2	97574
6	3.98	136680	3.429	3	10372
7	5.03	3086	.077	4	153
8	5.50	3265	.082	2	326
18	11.63	13890	.348	2	675
32	21.78	54611	1.370	2	10649
33	21.90	178710	4.483	2	14799
34	22.10	207590	5.207	2	10581

TOTAL AREA= 3986379  
 THRESHOLD= 1  
 MIN. PK. WIDTH= 15  
 AREA REJECT= 1000

## VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 4-1  
 MISC.: C=0.11631 GMS/ML

TIME: 12:34  
 DATE: 12/16/86  
 OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
 DELAY TIME: 0.00  
 CHAN: 0

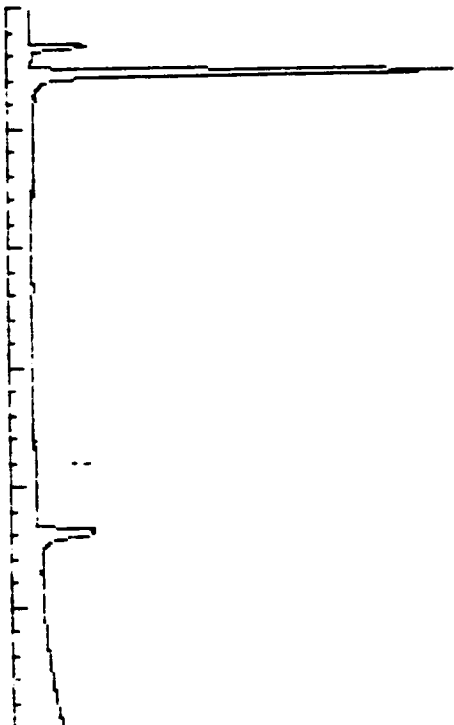
PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	1.60	76625	1.933	2	11349
4	1.80	191960	4.841	2	11360
5	3.20	3118800	78.659	2	97574
6	3.98	136680	3.447	3	10372
32	21.78	54611	1.377	2	10649
33	21.90	178710	4.507	2	14799
34	22.10	207590	5.236	2	10581

TOTAL AREA= 3964976  
 THRESHOLD= 1  
 MIN. PK. WIDTH= 15  
 AREA REJECT= 15000

CHART 6A  
 OF 11/16/86

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\*\*\* REAL TIME CHROMATOGRAM \*\*\*



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 4-2  
MISC.: C=0.10199 GMS/ML

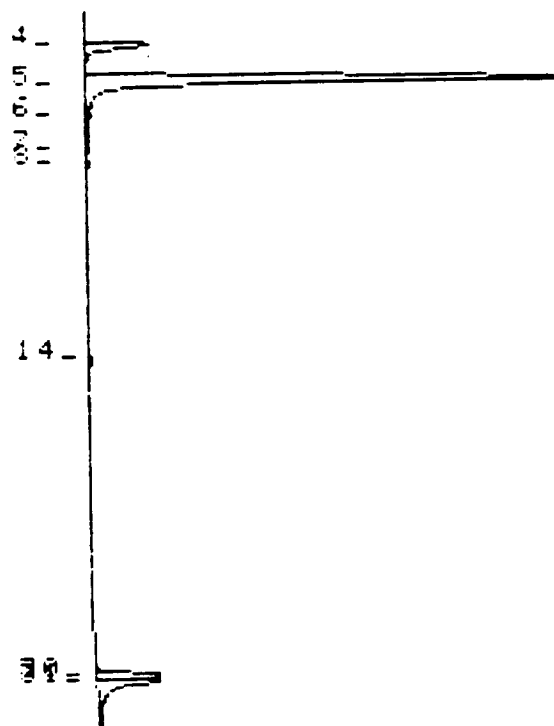
TIME: 14:04  
DATE: 12/16/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.65	139370	7.563	2	10853
5	2.90	1343400	72.896	3	81323
6	3.88	16833	.913	4	843
7	4.98	2075	.113	4	123
8	5.48	2769	.150	3	235
14	11.65	9910	.538	1	512
30	21.85	121440	6.590	2	10620
31	22.03	207110	11.238	2	10643

TOTAL AREA= 1842907  
THRESHOLD= 1  
MIN PK WIDTH= 15  
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 4-2  
MISC.: C=0.10199 GMS/ML

TIME: 14:04  
DATE: 12/16/86  
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES  
DELAY TIME: 0.00  
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.65	139370	7.694	2	10853
5	2.90	1343400	74.167	3	81323
30	21.85	121440	6.705	2	10620
31	22.03	207110	11.434	2	10643

TOTAL AREA= 1811320  
THRESHOLD= 1  
MIN PK WIDTH= 15  
AREA REJECT= 17000



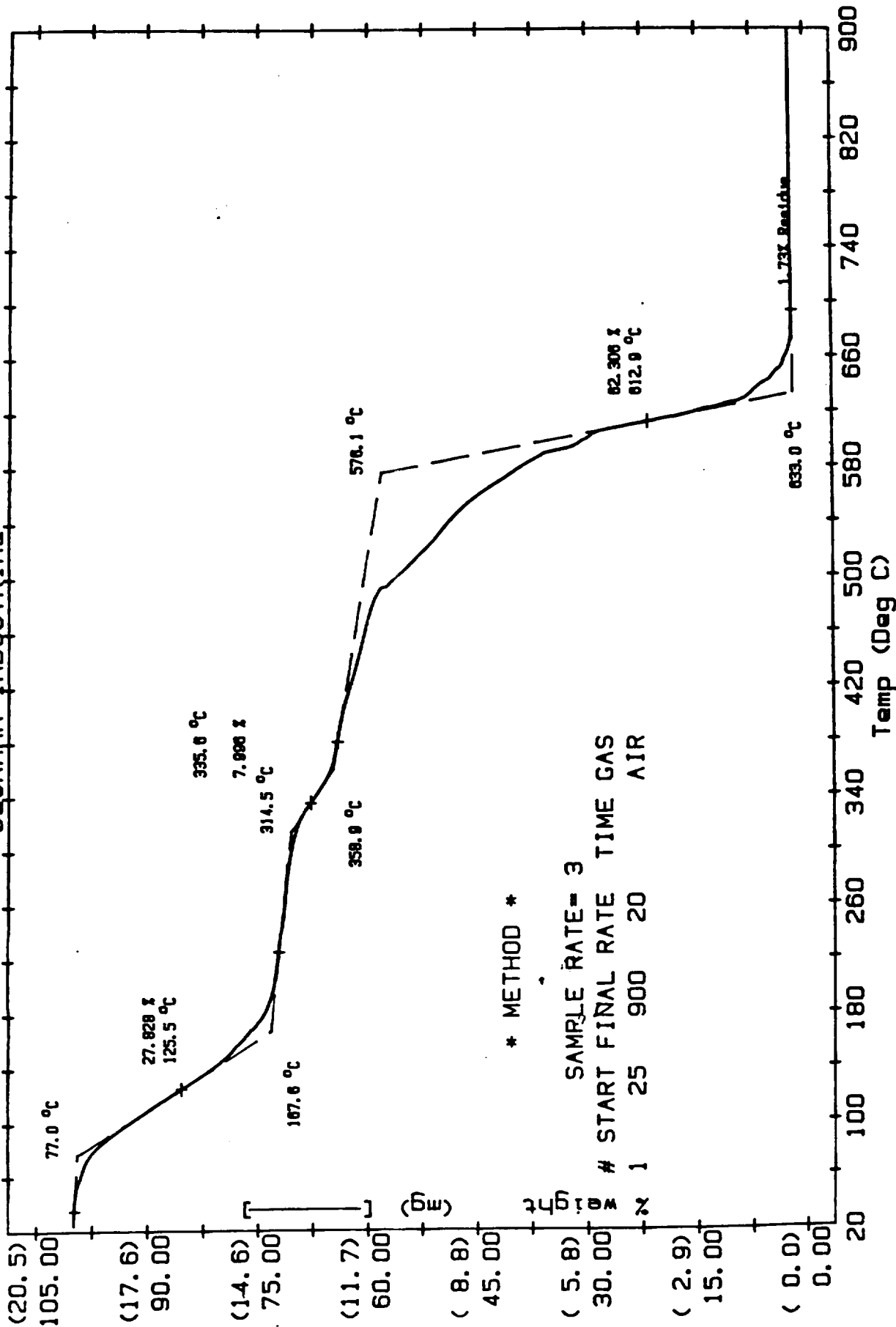
Sample: SUP39A71108 4-1  
 Size: 19.594 mg  
 Run No: MIR #13079 (12)  
 Date: MAY/21/86 14:16

Operator: M. WEGENER  
 Disk ID: DATA DISK #107  
 File No: D 37.DAT V2.1  
 Plotted: MAY/22/86 08:15

# TGA

## OMNITHERM DATA SYSTEM

### BECKMAN INDUSTRIAL



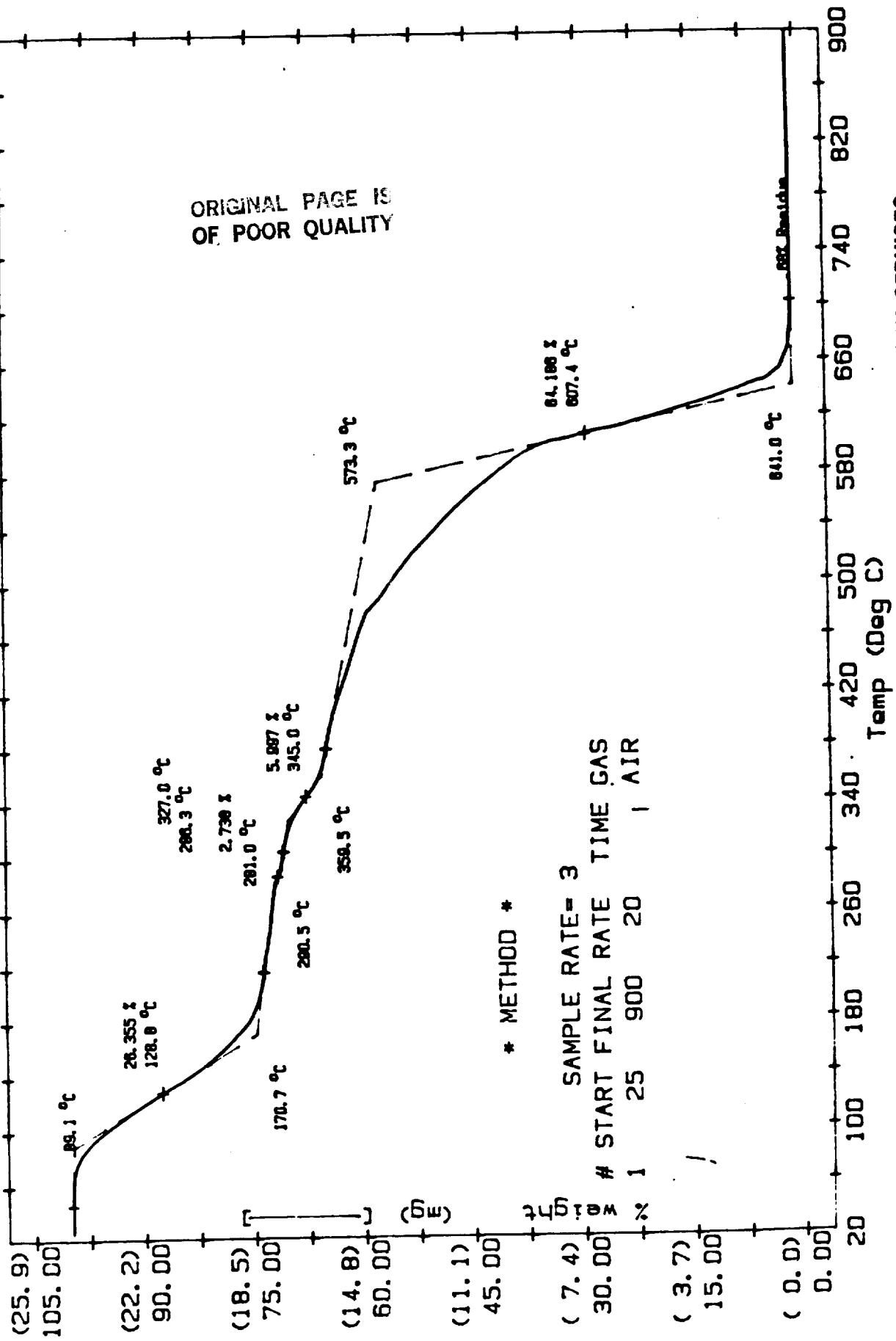
\* METHOD \*

SAMPLE RATE= 3  
 # START FINAL RATE TIME GAS  
 1 25 900 20 AIR

Operator: M. WEGENER  
Disk ID: DATA DISK #107  
File No: D 46.DAT V2.1  
Plotted: MAY/27/86 08:01

OMNITHERM DATA SYSTEM  
BECKMAN INDUSTRIAL

Sample: USP39A71108 4-2  
Size: 24.694 mg  
Run No: MIR #13080 (12)  
Date: MAY/22/86 07:18



RUN NO. \_\_\_\_\_ DATE 2-23-87OPERATOR gsk  
SAMPLE: 4-1

USP 39A

ATM. N<sub>2</sub> @ 1 atmFLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in. 50PROG. RATE, °C/min 20°HEAT ☒ COOL ☐ ISO ☐SHIFT, in. 0

DTA-DSC

SCALE, °C/in. 1.0/5X

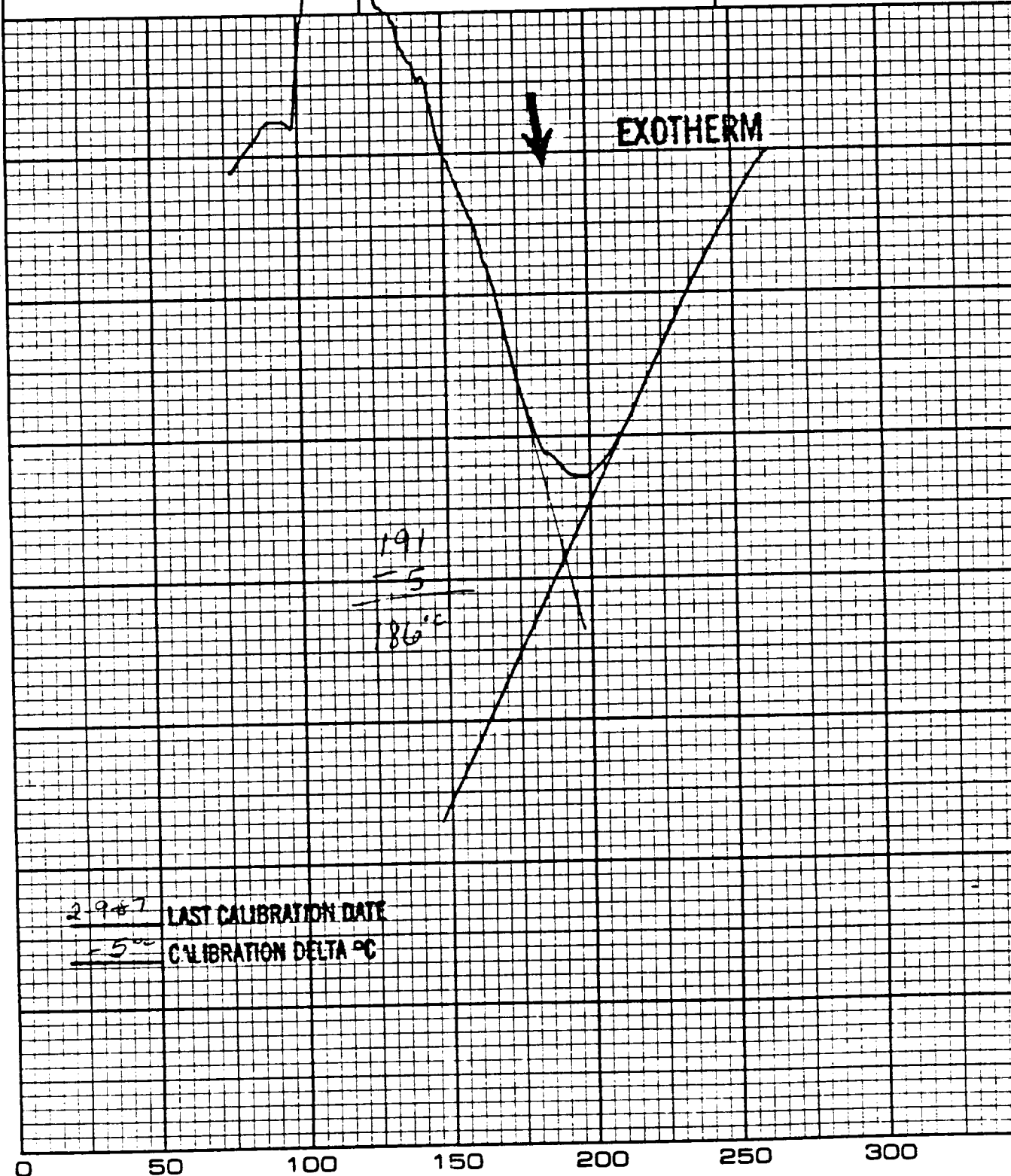
(mcal/sec)/in. \_\_\_\_\_

WEIGHT, mg 3.2

REFERENCE \_\_\_\_\_

1 alum seal

DUPONT Instruments  
 MEASURED VARIABLE \_\_\_\_\_

2-9-87

LAST CALIBRATION DATE

-5°C

CALIBRATION DELTA °C

0 50 100 150 200 250 300  
TEMPERATURE, °C (CH)

PART NO. 990088

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CHART 05

RUN NO. \_\_\_\_\_ DATE 2-23-87OPERATOR gsk  
SAMPLE: usp39A 4-2ATM N<sub>2</sub> @ 1 atm  
FLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in. 50PROG. RATE, °C/min 20HEAT ☒ COOL ☐ ISO ☐SHIFT, in. 0

DTA-DSC

SCALE, °C/in. 1.0/5x

(mcal/sec)/in. \_\_\_\_\_

WEIGHT, mg 3.9

REFERENCE \_\_\_\_\_

alum seal

DU PONT Instruments



MEASURED VARIABLE \_\_\_\_\_

EXOTHERM  
↓

193

-5

188°C

2-9-87

LAST CALIBRATION DATE

-5°

CALIBRATION DELTA °C

0 50 100 150 200 250 300

TEMPERATURE, °C (CHR)

ORIGINAL DATA  
ON 09-05-1986

## \*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

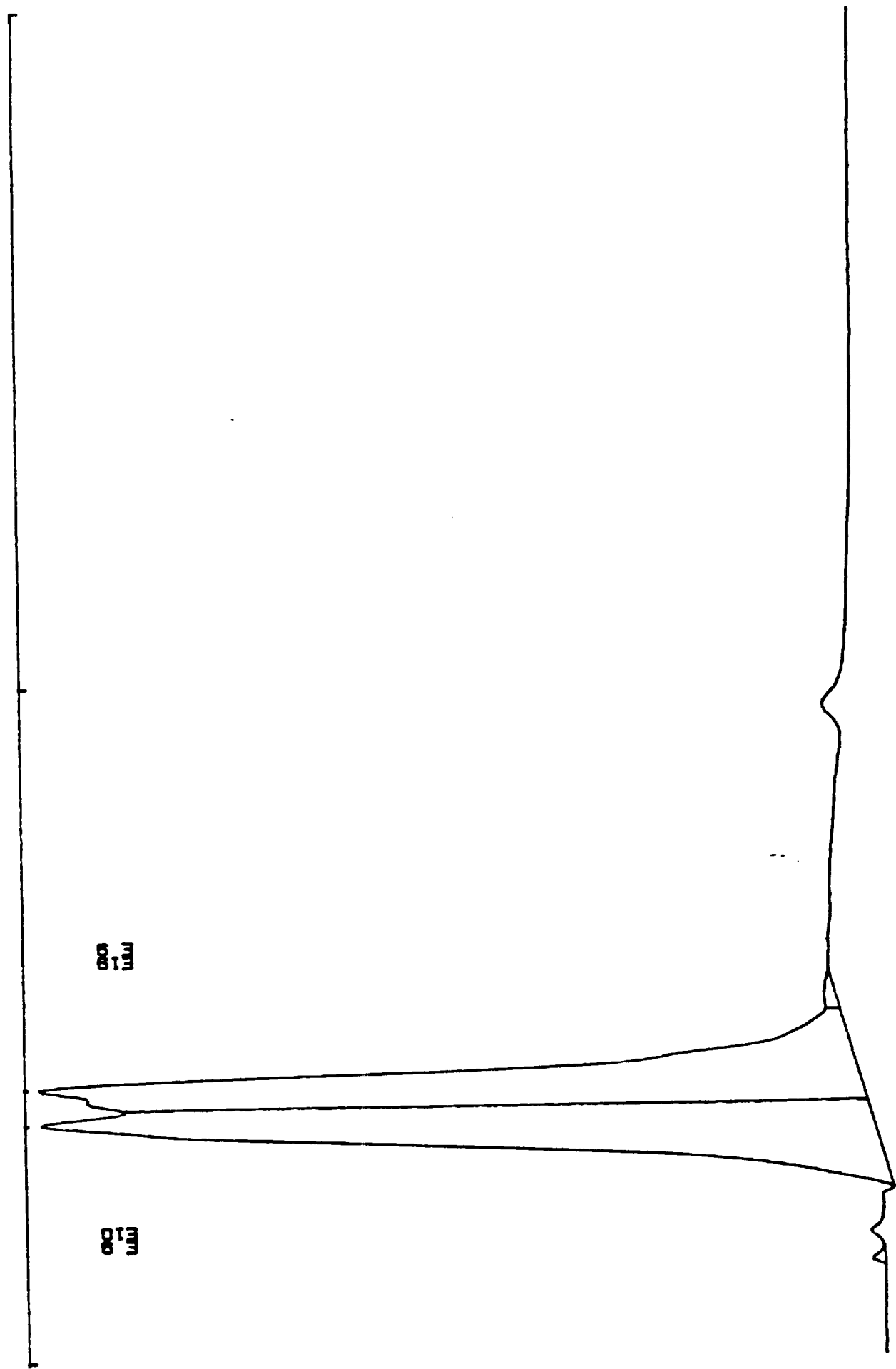
\*\*\*\*\*  
 \* Sample Name: USP39A,4-1,C=6.67 Operator Initials: JGZ \*  
 \* Date: 09-05-1986 12:02:14 Method: PHENDLIC DATA FILE: A:PHEND29.FTS \*  
 \* Interface: 4 Cycle#: 29 Channel#: 0 Vial#: N.A. \*  
 \* Starting Peak Width: 10 Threshold: .01 \*  
 \* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18 \*  
 \* Solvent Description: THF/WATER, 2:1 BY WEIGHT \*  
 \* Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN \*  
 \* Detector 0: 220NM/.5AU Detector 1: \*  
 \* Misc. Information: LENGTH=25 \*  
 \* Starting Delay: 0.00 Ending Retention Time: 10.00 \*  
 \*\*\*\*\*

Pk No.	Ret. Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.80	89195	51.2031	2	4841	100.000	18.4
3	2.07	85003	48.7969	2	4793	95.301	17.7

Total Area: 174198 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN029 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.416 Mv. HIGH SCALE= 10.388 Mv.  
USP-39A, 4-1. C-8.87 MG/ML, 9/5/86, JGZ

1.80  
2.97



# \*\*\*\*\* AREA PERCENT REPORT \*\*\*\*\*

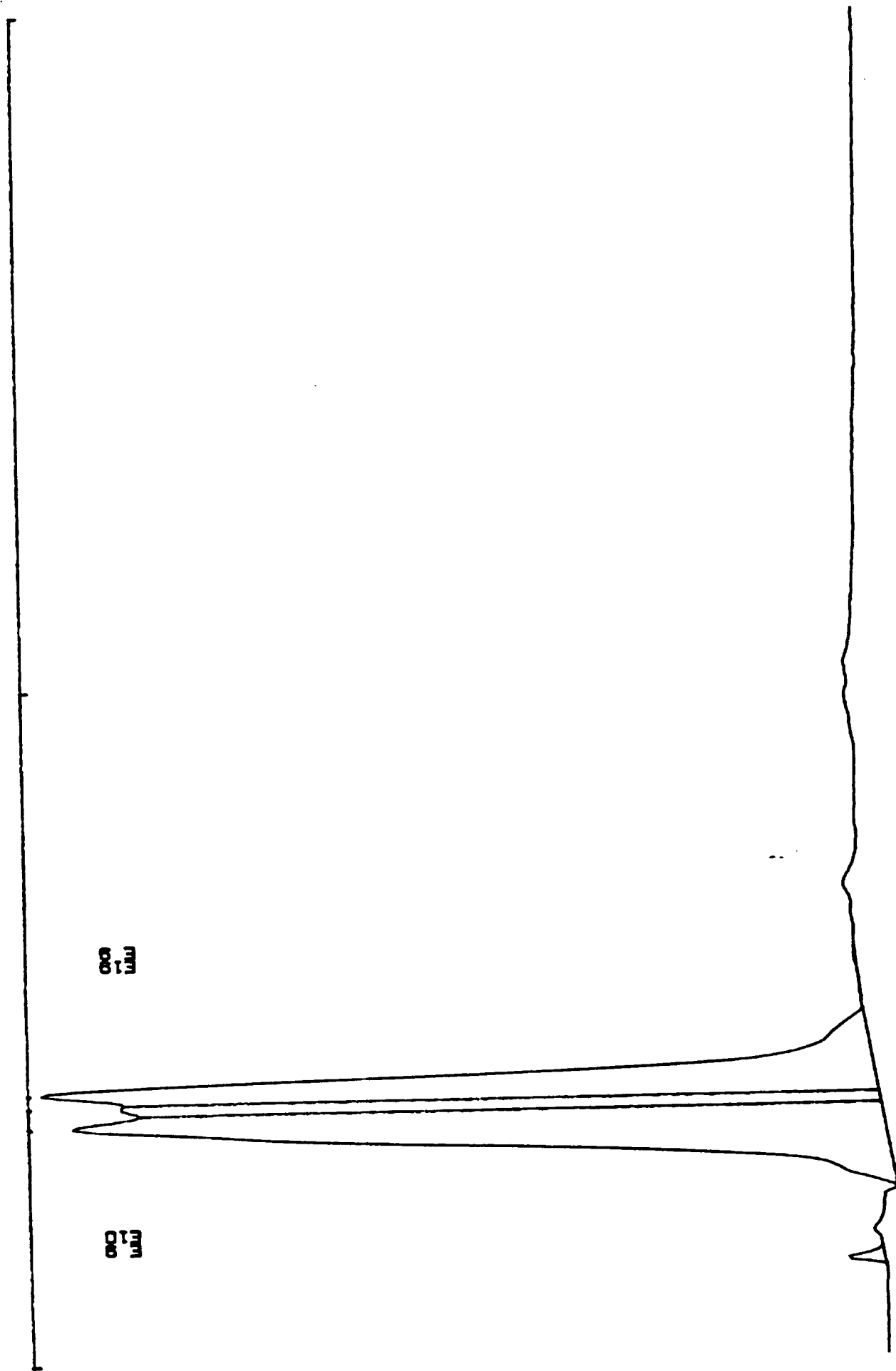
\*\*\*\*\*  
 Sample Name: USP39A,4-2,C=4.96 Operator Initials: JGZ  
 \* Date: 09-01-1986 15:58:03 Method: PHENOLIC DATA FILE: A:PHEND21.PTS  
 \* Interface: 4 Cycle#: 21 Channel#: 0 Vial#: N.A.  
 Starting Peak Width: 10 Threshold: .01  
 \*\*\*\*\*  
 \* Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18  
 Solvent Description: THF/WATER, 2:1 BY WEIGHT  
 Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN  
 \* Detector 0: 220NM/.5AU Detector 1:  
 \* Misc. Information: LENGTH=25  
 \*\*\*\*\*  
 Starting Delay: 0.00 Ending Retention Time: 10.00

k No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.80	81017	49.7413	2	4923	100.000	16.5
3	1.95	22173	13.6137	2	4605	27.369	4.8
4	2.05	59686	36.6450	2	5071	73.671	11.8

Total Area: 162876 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN021 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.445 Mv. HIGH SCALE= 10.636 Mv.  
USP-38A, 4-2, C=4.86 MG/ML, 8/2/86, JGZ

Q 100  
Q 100  
Q 100





# GPC CALIBRATION PLOT

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## \*\*\* Calibration Data \*\*\*

Calibration Name:

Misc Information:

Fit Type: 3

Log Mol Wt =  $A + Bx + Cx^2 + Dx^3$

A = 2.538977 B = 2.115815 C = -.5646824

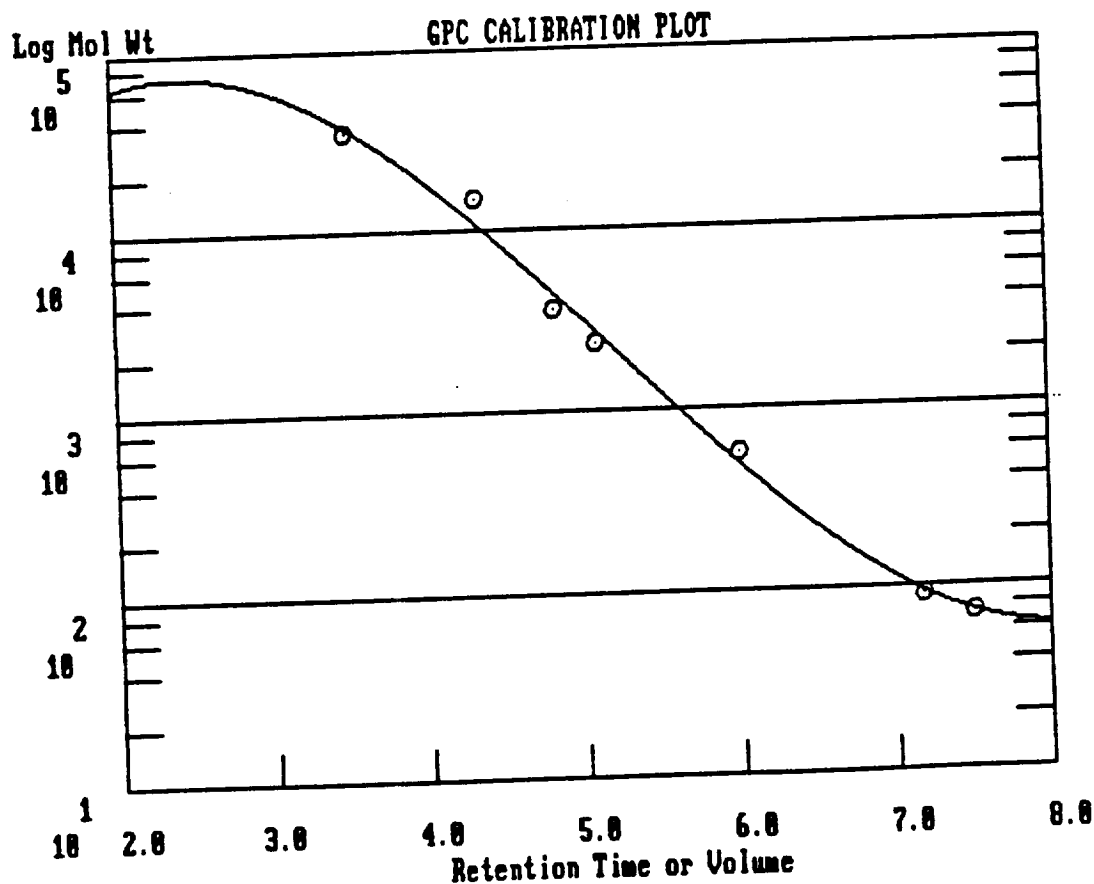
D = 3.606432E-02

Coefficient of Determination: 0.9902

Ret Time Molecular Weight

Log Mol Wt

3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



FILE A:GPC36.HDR TAKEN 08-05-1986 17:56:32

\*\*\*\*\* GPC REPORT \*\*\*\*\*

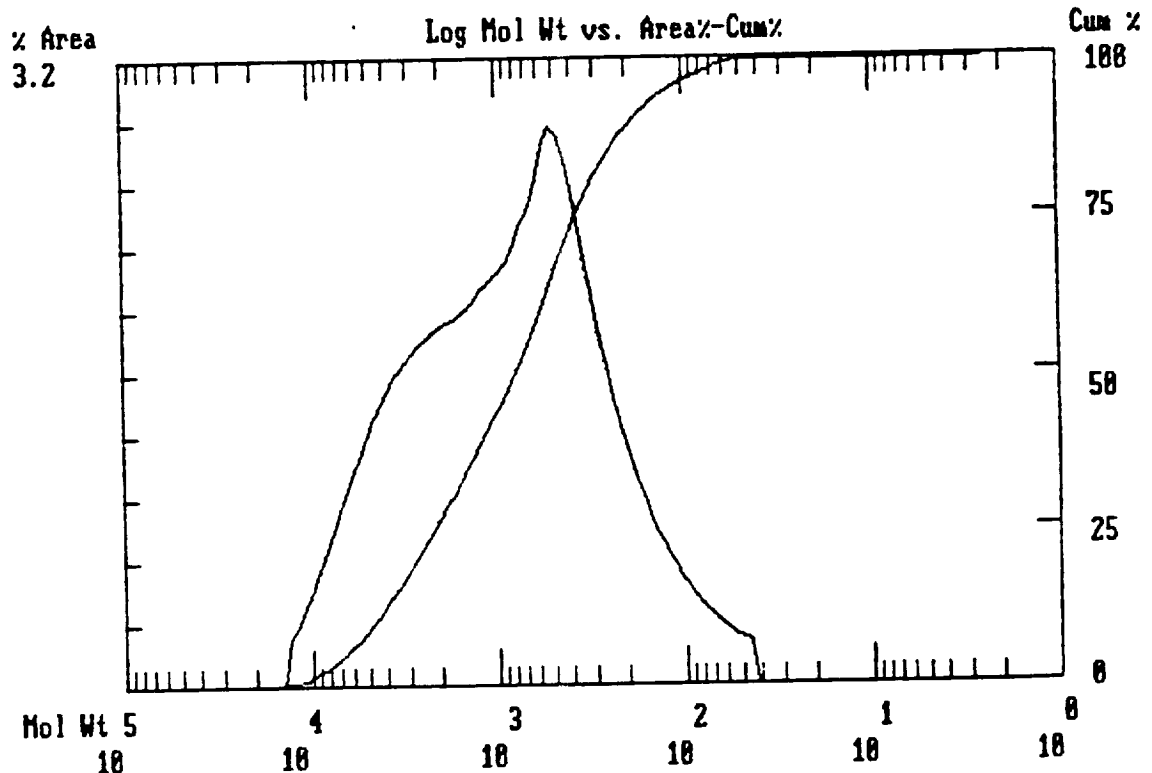
\*\*\*\*\*  
\* Sample Name: USF39A 4-1=2.68 Operator Initials: GBF \*  
\* Date: 08-05-1986 16:34:28 Method: DATA FILE: A:GPC36.PTS \*  
\* Interface: 5 Cycle#: 36 Channel#: 0 Vial#: N.A. \*  
\* Starting Peak Width: 60 Threshold: 0 \*  
\*\*\*\*\*  
\* Instrument Type: HPLC/BECKMAN Column Type: ULTRASTYRAGEL 500A \*  
\* Solvent Description: THF \*  
\* Operating Conditions: T=35C FLOWRATE=2.0ML/MIN \*  
\* Detector 0: 254NM/.1AU Detector 1: \*  
\* Misc. Information: CALIBRATION/GPC \*  
\*\*\*\*\*

Starting Delay: 0.00 Ending Retention Time: 10.00

Calibration file: GPCPHEN

Molecular Weight Distribution Averages

Baseline TIMES:	3.85 to	10.00	MW:	22295 to	2
Process TIMES:	3.85 to	10.00	MW:	22295 to	2
Total Area:	229203				
Mw=	1679				
M=	422				
M/Mn=	3.9799				
Mz=	4462				
=	1459				



FILE A:GPC37.HDR TAKEN 08-05-1986 17:59:34

\*\*\*\*\* GPC REPORT \*\*\*\*\*

```

*****
* Sample Name: USF39A 4-2=2.68          Operator Initials: GBF      *
* Date: 08-05-1986 16:46:38 Method:      DATA FILE: A:GPC37.PTS    *
* Interface: 5                          Cycle#: 37          Channel#: 0    Vial#: N.A.  *
* Starting Peak Width: 60 Threshold: 0    *
*****
* Instrument Type: HPLC/BECKMAN          Column Type: ULTRASTYRAGEL 500A *
* Solvent Description: THF               *
* Operating Conditions: T=35C FLOWRATE=2.0ML/MIN *
* Detector 0: 254NM/.1AU                 Detector 1: *
* Misc. Information: CALIBRATION/GPC      *
*****

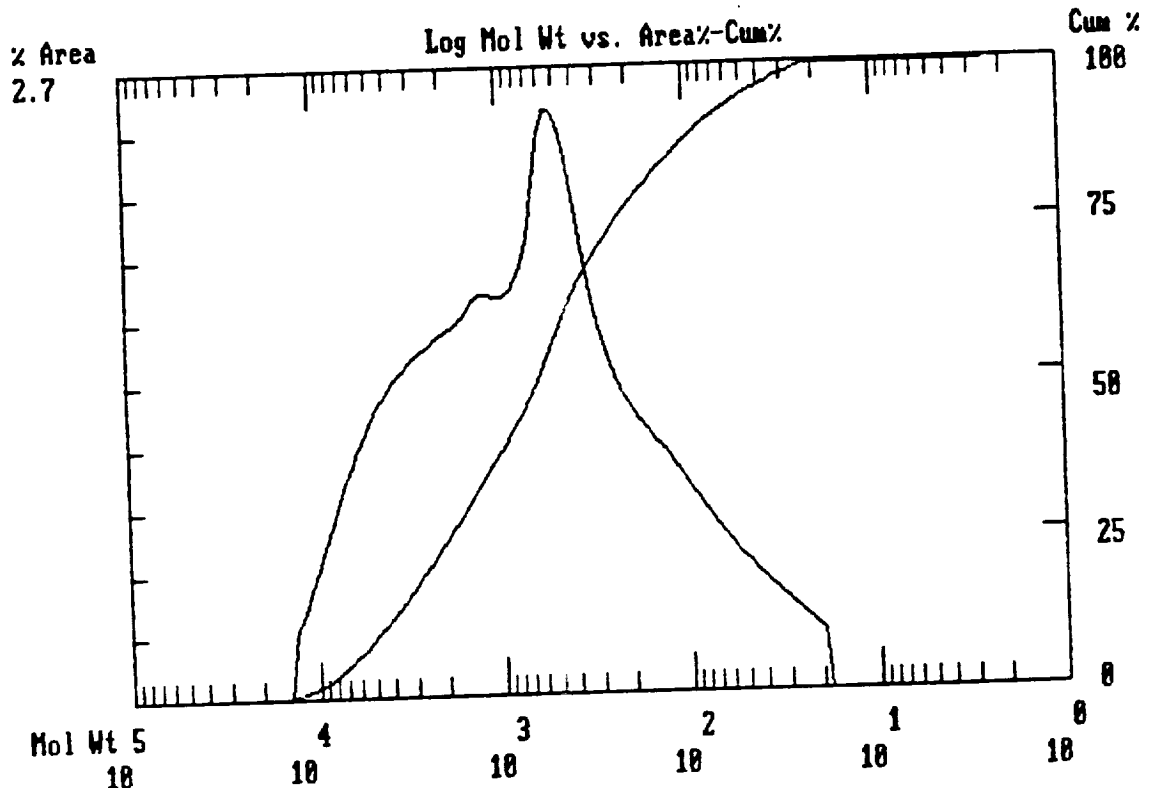
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Starting Delay: 0.00 Ending Retention Time: 10.00

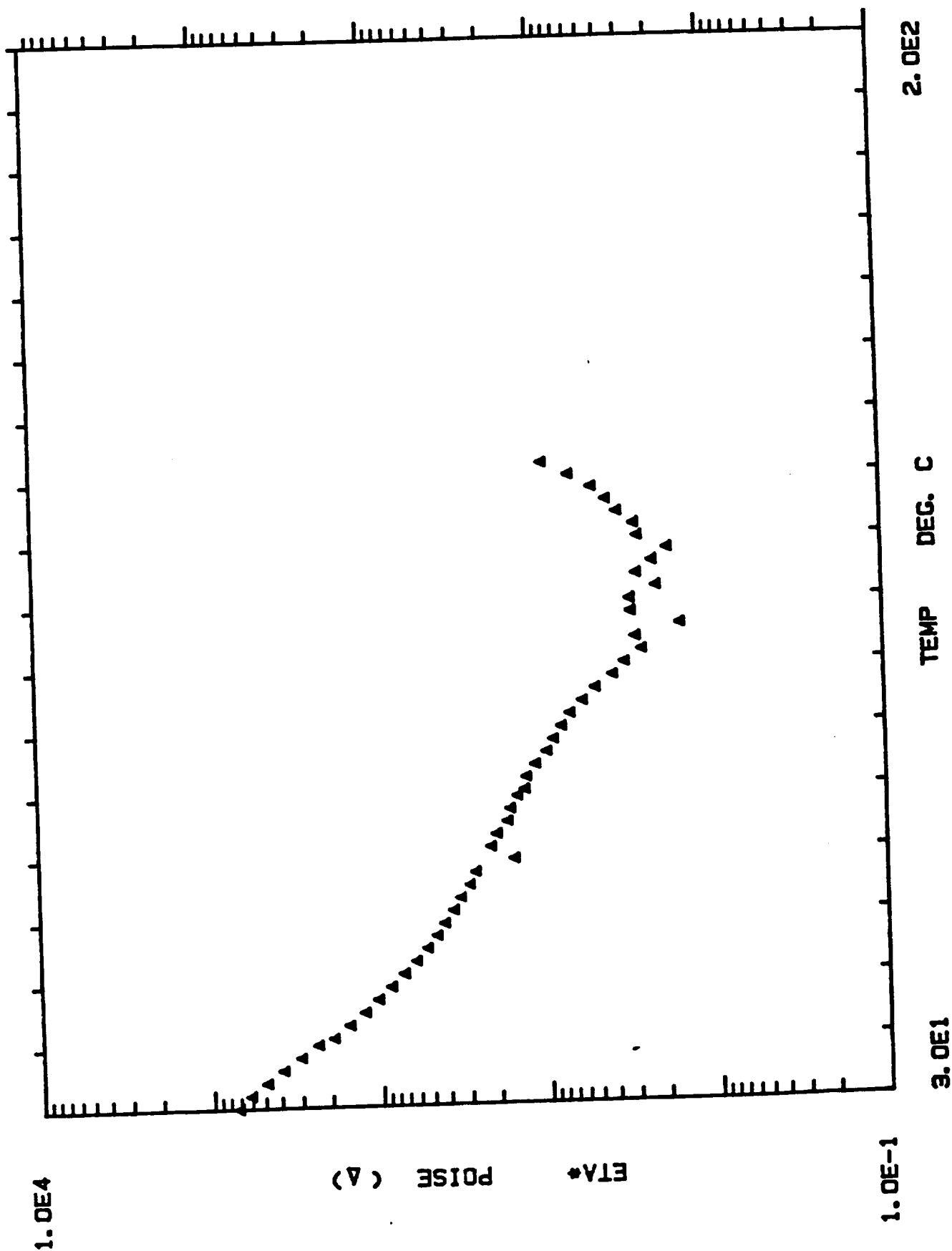
Calibration file: GPCPHEN

Molecular Weight Distribution Averages

Parameter	Range	MW	Count
Baseline TIMES	3.85 to 10.00	22295 to	2
Process TIMES	3.85 to 10.00	22295 to	2
Total Area	192576		
Mw	1577		
Mn	217		
M <sub>w</sub> /M <sub>n</sub>	7.2524		
Mz	4789		
	1326		



NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1



Rheometrics RECAP II

---

Experiment No. : 5 Sample No. : 1

Title:  
A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

Operator : cp

Date and Time : Monday, August 18, 1986 - 10:37:58

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE  
RADIUS : 25.00  
GAP : 0.50

Notes :

RAIN = 50%

FREQUENCY = 10 RAD/SEC

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NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

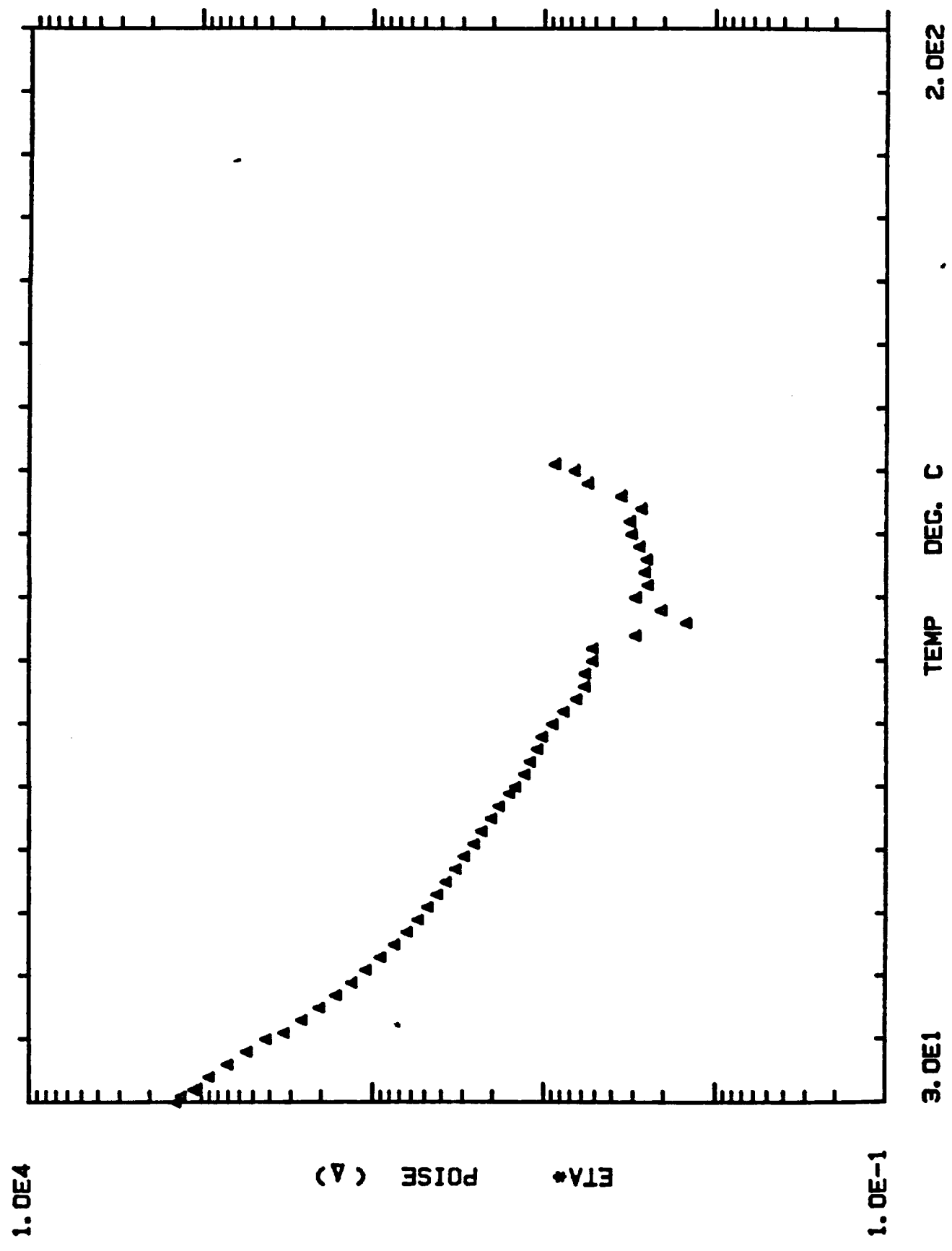
NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	7.356e+002	7.347e+002	3.604e+001	9.281e+001	2.000e+001	2.900e+001
2	6.972e+002	6.962e+002	3.653e+001	8.900e+001	1.000e+000	3.000e+001
3	5.909e+002	5.901e+002	3.035e+001	7.450e+001	2.000e+000	3.200e+001
4	4.739e+002	4.732e+002	2.555e+001	5.973e+001	3.000e+000	3.400e+001
5	3.764e+002	3.753e+002	2.849e+001	4.741e+001	4.000e+000	3.600e+001
6	2.946e+002	2.931e+002	2.905e+001	3.704e+001	5.000e+000	3.800e+001
7	2.327e+002	2.314e+002	2.503e+001	2.927e+001	6.000e+000	4.000e+001
8	1.876e+002	1.859e+002	2.533e+001	2.357e+001	7.000e+000	4.100e+001
9	1.507e+002	1.487e+002	2.445e+001	1.893e+001	8.000e+000	4.300e+001
10	1.215e+002	1.193e+002	2.343e+001	1.527e+001	9.000e+000	4.500e+001
11	1.010e+002	9.834e+001	2.309e+001	1.268e+001	1.000e+001	4.700e+001
12	8.403e+001	8.084e+001	2.311e+001	1.055e+001	1.100e+001	4.900e+001
13	7.028e+001	6.723e+001	2.049e+001	8.813e+000	1.200e+001	5.100e+001
14	5.958e+001	5.642e+001	1.915e+001	7.477e+000	1.300e+001	5.300e+001
15	5.106e+001	4.824e+001	1.673e+001	6.413e+000	1.400e+001	5.500e+001
16	4.459e+001	4.208e+001	1.475e+001	5.599e+000	1.500e+001	5.700e+001
17	4.010e+001	3.795e+001	1.295e+001	5.030e+000	1.600e+001	5.900e+001
18	3.536e+001	3.360e+001	1.100e+001	4.437e+000	1.700e+001	6.100e+001
19	3.190e+001	3.052e+001	9.294e+000	3.999e+000	1.800e+001	6.300e+001
20	2.823e+001	2.706e+001	8.066e+000	3.540e+000	1.900e+001	6.500e+001
21	2.593e+001	2.497e+001	6.980e+000	3.254e+000	2.000e+001	6.700e+001
22	1.518e+001	1.340e+001	7.078e+000	1.902e+000	2.100e+001	6.900e+001
23	2.092e+001	2.021e+001	5.397e+000	2.625e+000	2.200e+001	7.100e+001
24	1.918e+001	1.861e+001	4.625e+000	2.406e+000	2.300e+001	7.300e+001
25	1.646e+001	1.596e+001	4.031e+000	2.066e+000	2.400e+001	7.500e+001
26	1.582e+001	1.536e+001	3.810e+000	1.985e+000	2.500e+001	7.700e+001
27	1.428e+001	1.386e+001	3.450e+000	1.792e+000	2.600e+001	7.900e+001
28	1.286e+001	1.247e+001	3.145e+000	1.612e+000	2.700e+001	8.000e+001
29	1.250e+001	1.219e+001	2.770e+000	1.569e+000	2.800e+001	8.200e+001
30	1.103e+001	1.065e+001	2.864e+000	1.385e+000	2.900e+001	8.400e+001
31	9.406e+000	9.166e+000	2.113e+000	1.180e+000	3.000e+001	8.600e+001
32	8.563e+000	8.359e+000	1.860e+000	1.075e+000	3.100e+001	8.800e+001
33	7.639e+000	7.351e+000	2.078e+000	9.584e-001	3.200e+001	9.000e+001
34	6.766e+000	6.563e+000	1.644e+000	8.495e-001	3.300e+001	9.200e+001
35	5.684e+000	5.498e+000	1.444e+000	7.128e-001	3.400e+001	9.400e+001
36	4.764e+000	4.696e+000	8.022e-001	5.979e-001	3.500e+001	9.600e+001
37	3.731e+000	2.963e+000	2.268e+000	4.581e-001	3.600e+001	9.800e+001
38	3.183e+000	3.105e+000	6.963e-001	3.995e-001	3.700e+001	1.000e+002
39	2.505e+000	2.229e+000	1.143e+000	3.142e-001	3.800e+001	1.020e+002
40	2.716e+000	2.646e+000	6.147e-001	3.410e-001	3.900e+001	1.040e+002
41	1.481e+000	1.330e+000	6.518e-001	1.260e-001	4.000e+001	1.060e+002
42	2.581e+000	2.760e+000	8.249e-001	3.613e-001	4.100e+001	1.080e+002
43	2.905e+000	2.869e+000	4.572e-001	3.646e-001	4.200e+001	1.100e+002
44	2.030e+000	1.650e+000	8.377e-001	2.546e-001	4.300e+001	1.120e+002
45	2.647e+000	2.470e+000	9.504e-001	3.320e-001	4.400e+001	1.140e+002
46	2.124e+000	1.852e+000	1.040e+000	2.663e-001	4.500e+001	1.160e+002
47	1.720e+000	1.529e+000	7.970e-001	2.164e-001	4.600e+001	1.180e+002
48	2.573e+000	2.267e+000	1.215e+000	3.231e-001	4.700e+001	1.200e+002
49	2.691e+000	2.318e+000	1.362e+000	3.377e-001	4.800e+001	1.220e+002
50	3.357e+000	2.814e+000	1.849e+000	4.228e-001	4.900e+001	1.240e+002

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

NO.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	3.894e+000	3.271e+000	2.112e+000	4.867e-001	5.000e+001	1.260e+002
52	4.707e+000	3.972e+000	2.525e+000	5.911e-001	5.100e+001	1.290e+002
53	6.426e+000	5.930e+000	2.477e+000	8.062e-001	5.200e+001	1.300e+002
4	9.204e+000	8.352e+000	3.868e+000	1.156e+000	5.300e+001	1.320e+002

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NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2





Rheometrics RECAP II

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Experiment No. : 6      Sample No. : 1

Title:  
NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

Operator : CP

Date and Time : Monday, August 18, 1986 - 12:16:20

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE  
          RADIUS : 25.00  
          GAP : 0.50

Notes :  
STRAIN = 50%  
FREQUENCY = 10 RAD/SEC

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NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

NO.	ETA* POISE	ETA' POISE	ETA'' POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.376e+003	1.376e+003	4.762e+001	1.742e+002	2.000e-001	3.000e+001
2	1.278e+003	1.278e+003	4.150e+001	1.617e+002	1.000e+000	3.100e+001
3	1.080e+003	1.080e+003	3.796e+001	1.365e+002	2.000e+000	3.200e+001
4	8.733e+002	8.731e+002	3.545e+001	1.104e+002	3.000e+000	3.400e+001
5	6.808e+002	6.801e+002	3.189e+001	8.591e+001	4.000e+000	3.600e+001
6	5.270e+002	5.263e+002	2.742e+001	6.640e+001	5.000e+000	3.800e+001
7	4.065e+002	4.055e+002	2.577e+001	5.112e+001	6.000e+000	4.000e+001
8	3.184e+002	3.173e+002	2.591e+001	4.002e+001	7.000e+000	4.100e+001
9	2.503e+002	2.490e+002	2.551e+001	3.146e+001	8.000e+000	4.300e+001
10	1.979e+002	1.963e+002	2.496e+001	2.488e+001	9.000e+000	4.500e+001
11	1.583e+002	1.565e+002	2.356e+001	1.988e+001	1.000e+001	4.700e+001
12	1.275e+002	1.253e+002	2.335e+001	1.602e+001	1.100e+001	4.900e+001
13	1.055e+002	1.030e+002	2.283e+001	1.325e+001	1.200e+001	5.100e+001
14	8.672e+001	8.404e+001	2.163e+001	1.089e+001	1.300e+001	5.300e+001
15	7.319e+001	6.930e+001	2.022e+001	9.055e+000	1.400e+001	5.500e+001
16	6.079e+001	5.825e+001	1.737e+001	7.630e+000	1.500e+001	5.700e+001
17	5.253e+001	5.019e+001	1.553e+001	6.596e+000	1.600e+001	5.900e+001
18	4.614e+001	4.405e+001	1.374e+001	5.792e+000	1.700e+001	6.100e+001
19	4.050e+001	3.872e+001	1.186e+001	5.084e+000	1.800e+001	6.300e+001
20	3.557e+001	3.452e+001	9.737e+000	4.501e+000	1.900e+001	6.500e+001
21	3.161e+001	3.043e+001	8.555e+000	3.968e+000	2.000e+001	6.700e+001
22	2.826e+001	2.730e+001	7.263e+000	3.544e+000	2.100e+001	6.900e+001
23	2.471e+001	2.373e+001	6.270e+000	3.106e+000	2.200e+001	7.100e+001
24	2.225e+001	2.159e+001	5.329e+000	2.791e+000	2.300e+001	7.300e+001
25	1.955e+001	1.898e+001	4.673e+000	2.455e+000	2.400e+001	7.500e+001
26	1.766e+001	1.711e+001	4.373e+000	2.216e+000	2.500e+001	7.700e+001
27	1.533e+001	1.497e+001	3.306e+000	1.924e+000	2.600e+001	7.900e+001
28	1.419e+001	1.375e+001	3.507e+000	1.731e+000	2.700e+001	8.000e+001
29	1.251e+001	1.205e+001	3.343e+000	1.570e+000	2.800e+001	8.200e+001
30	1.159e+001	1.127e+001	2.722e+000	1.455e+000	2.900e+001	8.400e+001
31	1.051e+001	1.023e+001	2.409e+000	1.318e+000	3.000e+001	8.600e+001
32	9.822e+000	9.514e+000	2.674e+000	1.240e+000	3.100e+001	8.800e+001
33	8.555e+000	8.397e+000	1.638e+000	1.073e+000	3.200e+001	9.000e+001
34	7.367e+000	7.234e+000	1.393e+000	9.245e-001	3.300e+001	9.200e+001
35	6.176e+000	6.091e+000	1.133e+000	7.771e-001	3.400e+001	9.400e+001
36	5.547e+000	5.406e+000	1.240e+000	6.961e-001	3.500e+001	9.600e+001
37	5.524e+000	5.374e+000	1.279e+000	6.927e-001	3.600e+001	9.800e+001
38	5.003e+000	4.947e+000	7.478e-001	6.278e-001	3.700e+001	1.000e+002
39	4.571e+000	4.856e+000	9.667e-001	6.258e-001	3.800e+001	1.020e+002
40	2.805e+000	2.645e+000	9.123e-001	3.519e-001	3.900e+001	1.040e+002
41	1.425e+000	1.229e+000	7.202e-001	1.788e-001	4.000e+001	1.060e+002
42	1.995e+000	1.774e+000	9.136e-001	2.504e-001	4.100e+001	1.080e+002
43	2.315e+000	2.740e+000	6.471e-001	3.534e-001	4.200e+001	1.100e+002
44	2.394e+000	2.342e+000	4.931e-001	3.003e-001	4.300e+001	1.120e+002
45	2.505e+000	2.454e+000	3.215e-001	3.146e-001	4.400e+001	1.140e+002
46	2.430e+000	2.340e+000	6.570e-001	3.049e-001	4.500e+001	1.160e+002
47	2.658e+000	2.495e+000	1.000e+000	3.374e-001	4.600e+001	1.180e+002
48	2.979e+000	2.814e+000	9.793e-001	3.741e-001	4.700e+001	1.200e+002
49	3.045e+000	2.971e+000	6.678e-001	3.820e-001	4.800e+001	1.220e+002
50	2.614e+000	2.449e+000	9.131e-001	3.281e-001	4.900e+001	1.240e+002

NASA FINGERPRINT VISCOSITY PROFILE USE 394RESIN NASA LOT4-2

---

Q.	ETA*	ETA'	ETA''	TORQUE	TIME	TEMP
	POISE	POISE	POISE	GRAMS-CM	MIN.	DEG. C
51	3.427e+000	3.307e+000	8.978e-001	4.300e-001	5.000e+001	1.260e+002
52	5.347e+000	5.019e+000	1.845e+000	6.710e-001	5.100e+001	1.280e+002
53	6.402e+000	6.055e+000	2.079e+000	8.032e-001	5.200e+001	1.300e+002
54	8.322e+000	7.925e+000	2.347e+000	1.045e+000	5.300e+001	1.310e+002

ORIGINAL PAGE 3  
OF POOR QUALITY

SOLVENT ONLY  
SCAN

ORIGINAL PAGE IS  
OF POOR QUALITY

SPECTRUM NO. 1A of 7  
solvent scan

REMARKS:

SAMPLE: Solvent  
SOLVENT: United-d + 0.8378  
DEC. LEVEL: \_\_\_\_\_

AUTO ☐  
(250)  
(500)  
( 2)  
( .05)

MANUAL

SWEEP TIME (SEC): 0  
SWEEP WIDTH (Hz): 25 50 100 500 1000  
FILTER: 1 2 3 4 5 6 7 8  
RF POWER LEVEL: 0.20

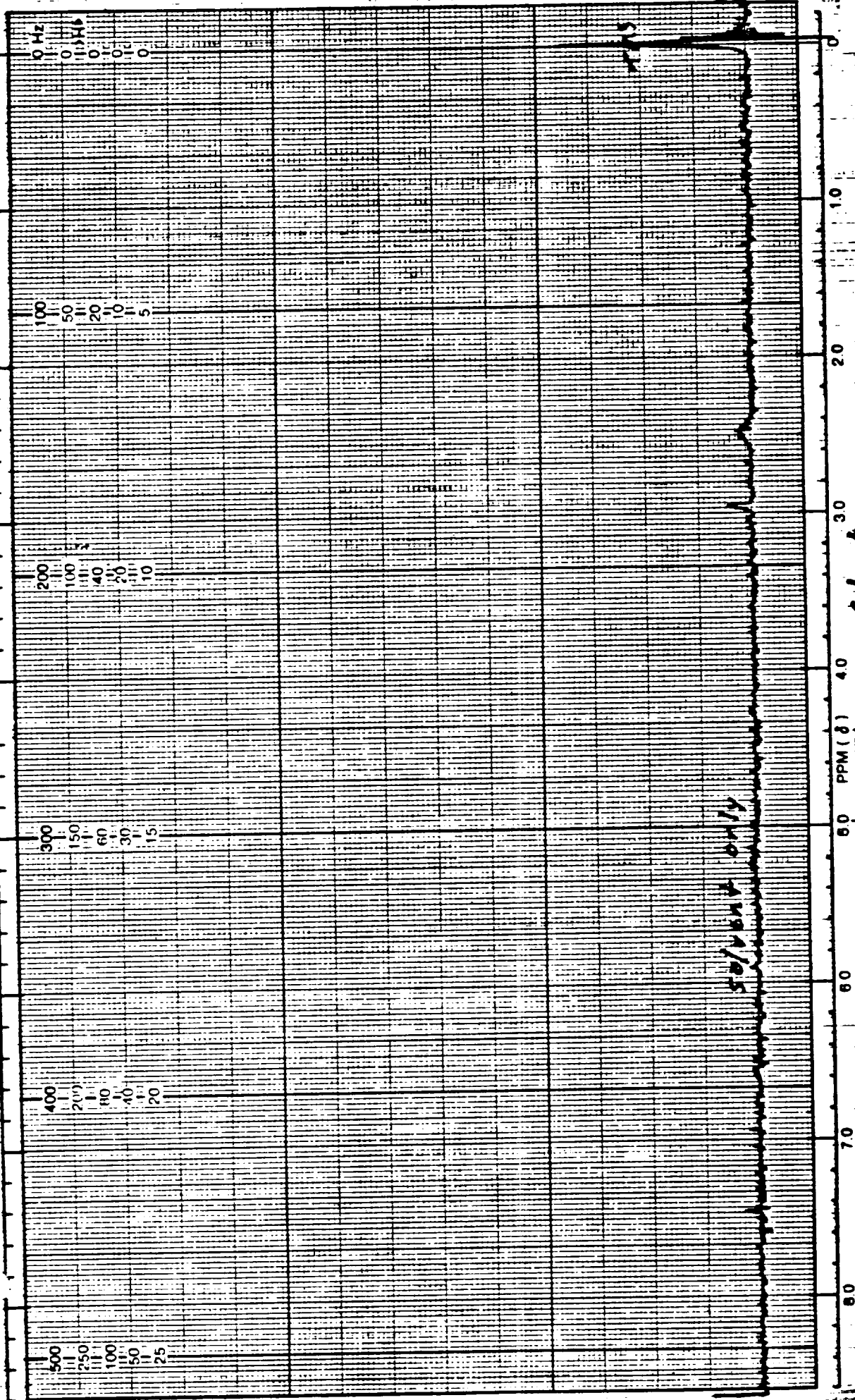
SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 1.0  
INTEGRAL AMPLITUDE: 1  
SPINNING RATE (RPS): 30

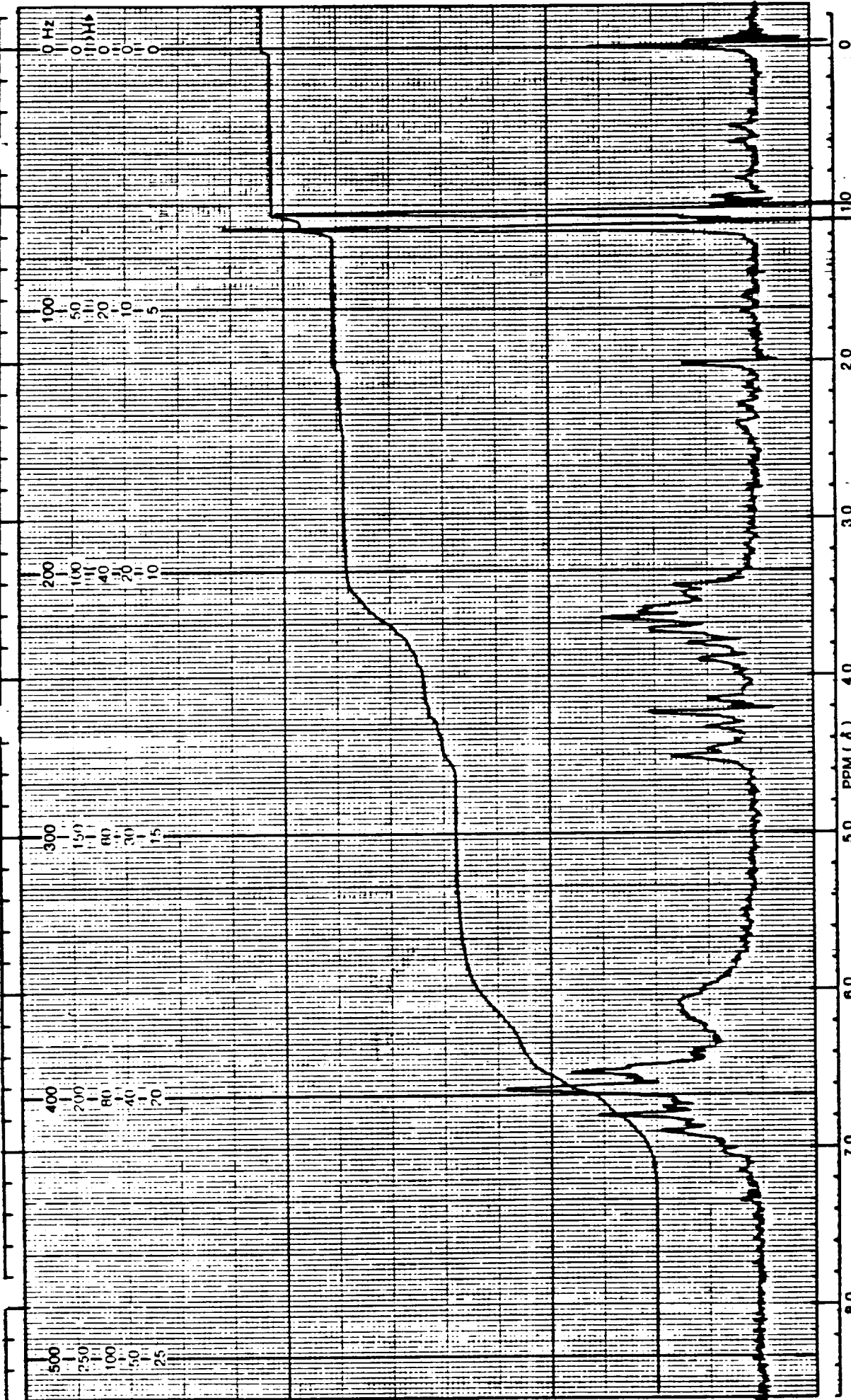
OPERATOR P & W

DATE 3-21-86

NORELL, INC.  
LANDISVILLE, N.J. 08326

solvent only





0.106 gm sample  
0.906 gm solvent

SAMPLE: ASP-39A 6844-1 REMARKS:  
SOLVENT: Unisol-d + 0.52 Tms  
DEC. LEVEL

AUTO ☐  
(250)  
(500)  
( 2)  
( .05)

MANUAL

SWEEP TIME (SEC): 30 150 300 600  
SWEEP WIDTH (Hz): 23 20 100 300 500  
FILTER: 2 3 7 5 7 0  
RF POWER LEVEL: 0.25

SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 1.0  
INTEGRAL AMPLITUDE: 1.0  
SPINNING RATE (RPS): 30

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6 of 7 USP-39A  
6844-1

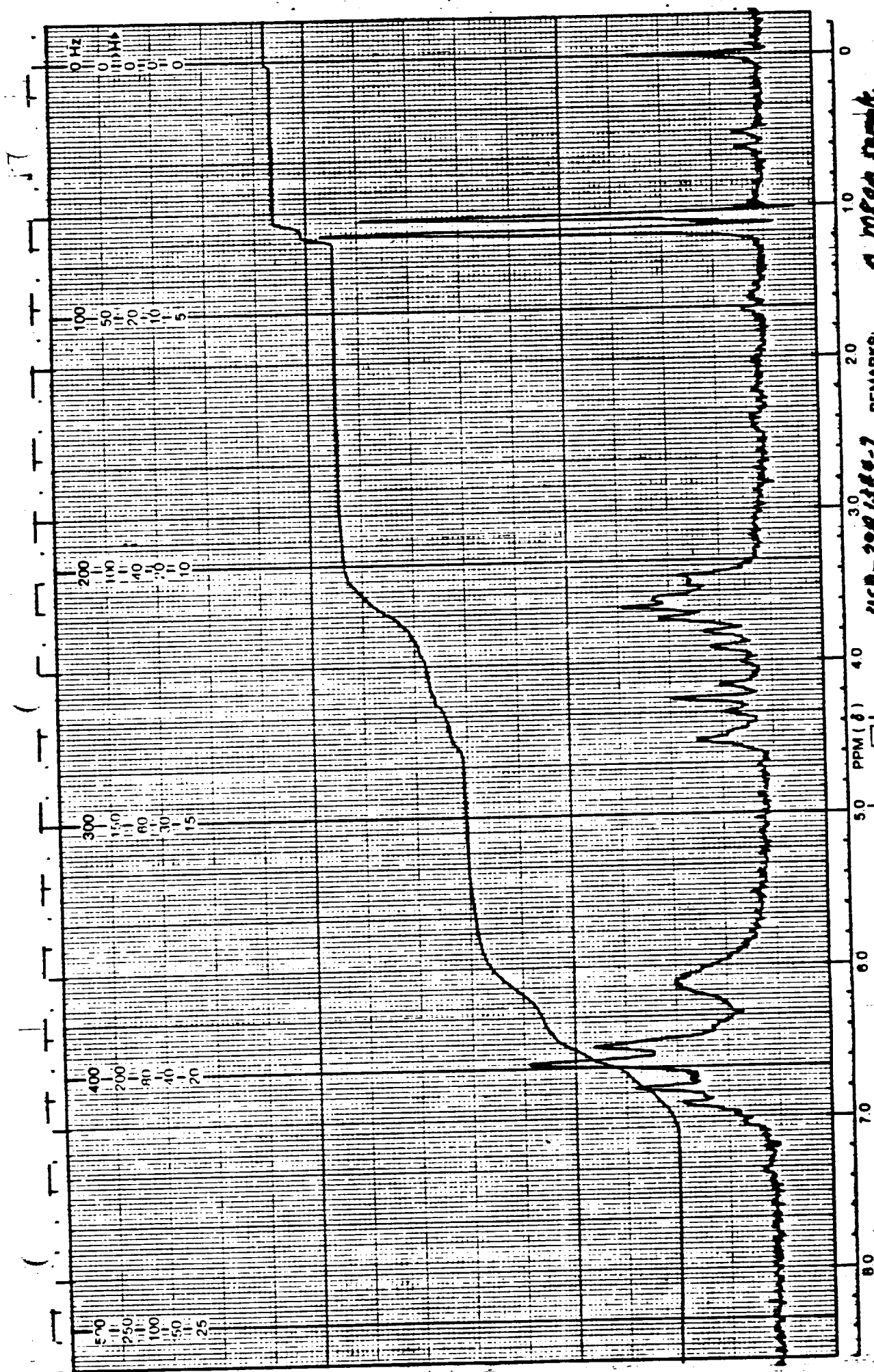
SPECTRUM NO.

OPERATOR DFW

DATE: 3-21-86

NORELL, INC.  
LANDISVILLE, N.J. 08326

TEO Phone: (609) 697-0020



0.1089g sample  
0.836 gm solvent

SAMPLE: USP-39A 1384-2  
SOLVENT: Unisol-d + 0.52 TMS  
DEC. LEVEL

MANUAL ☒ AUTO  
SWEEP TIME (SEC): 20 (250) (500)  
SWEEP WIDTH (Hz): 25 (25) (50) (100) (200) (500)  
FILTER: 1 2 3 4 5 6 7 8  
RF POWER LEVEL: 0.25 (0.05)

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SPECTRUM NO 7067 USP-39A  
Lot # 4-2

OPERATOR D6W

DATE 3-21-86

SWEEP OFFSET (Hz): 0  
SPECTRUM AMPLITUDE: 2.0  
INTEGRAL AMPLITUDE: 8.0  
SPINNING RATE (RPS): 3.0

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## FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

### WCA Fabric for NASA Lot# 4 (KAISER)

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1b. Breaking Strength, FILL.....	1
2a. Carbon Assay.....	1
2b. Hydrogen Assay.....	1
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3. Visual Inspection.....	1
4. Specific Gravity.....	1
5. pH.....	2
6. TGA.....	2
7a. Atomic Absorption.....	2
7b. Moisture Content.....	2
7c. Ash Content.....	2
8a. Filament diameter, WARP.....	2
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### CHARTS

Visual Inspection.....	3A
TGA.....	6A - 6B



## FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 4 (KAISER)1a. Breaking Strength, lbs/in, WARP  
ASTM D1682

	<u>#4-2S</u>	<u>#4-2E</u>	<u>LOT4 AVG</u>
PICK	31	31	31.0
CENTER	32	57	44.5
PLAIN	<u>37</u>	<u>43</u>	<u>40.0</u>
AVG.	33.3	43.7	38.5

1b. Breaking Strength, lbs/inch, FILL  
ASTM D1682

PICK	10	14	12.0
CENTER	13	17	15.0
PLAIN	<u>15</u>	<u>29</u>	<u>22.0</u>
AVG.	12.7	20.0	16.3

2a. Carbon Assay, %  
MDQAI 5560

PICK	99.9	99.2	99.55
CENTER	99.9	99.6	99.75
PLAIN	<u>99.2</u>	<u>99.5</u>	<u>99.35</u>
AVG.	99.67	99.43	99.55

2b. Hydrogen Assay, %  
MDQAI 5560

PICK	<.01	<.01	EST .001
CENTER	<.01	<.01	EST .001
PLAIN	<u>&lt;.01</u>	<u>&lt;.01</u>	<u>EST .001</u>
AVG.	EST .001	EST .001	EST .001

2c. Nitrogen Assay, %  
MDQAI 5560

PICK	.1	.03	.065
CENTER	.1	.10	.100
PLAIN	<u>.1</u>	<u>.20</u>	<u>.150</u>
AVG.	.1	.11	.105

3. Visual Inspection  
QC1-102

See Charts 3A

4. Specific Gravity, Units  
PTM-84

PICK	1.6099	1.6009	1.6054
CENTER	1.6355	1.6121	1.6238
PLAIN	<u>1.6707</u>	<u>1.6395</u>	<u>1.6551</u>
AVG.	1.639	1.618	1.628



WCA Fabric for NASA Lot# 4 (KAISER)5. pH, Units  
CTM-24B

	<u>#4-2S</u>	<u>#4-2E</u>	<u>LOT4 AVG</u>
	6.2	6.3	6.25
	<u>6.2</u>	<u>6.4</u>	<u>6.30</u>
AVG.	6.2	6.35	6.28

6. TGA, °C at 50% Weight Loss  
CTM-51 (AIR)

	<u>SET UP# 1</u>	<u>SET UP# 2</u>
	#4-2E 955	#4-2S 868

See Chart 6A-6B

7a. Atomic Absorption, ppm  
CTM-53B

	<u>#4-2S</u>	<u>#4-2E</u>	<u>LOT4 AVG</u>
Na	5	6	5.5
K	0	0	0.0
Ca	4	6	5.0
Mg	3	2	2.5
Li	<u>0</u>	<u>0</u>	<u>0.0</u>
AVG.	12	14	13.0

7b. Moisture Content, %  
CTM-53B

	.005	.005	.005
--	------	------	------

7c. Ash Content, %  
CTM-53B

	.010	.010	.010
--	------	------	------

8a. Filament diameter, microns, WARP  
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE	10.67	10.18	10.42
Minimum	9.50	8.00	8.00
Maximum	11.65	11.20	11.65
Std. Dev	0.64	1.10	0.91

9a. Thread Count, per inch, WARP  
PTM-5A

	<u>#4-2S</u>	<u>#4-2E</u>	<u>LOT4 AVG</u>
	29	29	29
	29	29	29
	29	29	29
	29	29	29
	29	29	29
	<u>29</u>	<u>29</u>	<u>29</u>
AVG.	29.0	29.0	29.0

9b. Thread Count, per inch, FILL  
PTM-5A

	<u>#4-2S</u>	<u>#4-2E</u>	<u>LOT4 AVG</u>
	22	22	22
	22	22	22
	22	22	22
	22	22	22
	<u>22</u>	<u>22</u>	<u>22</u>
AVG.	22.0	22.0	22.0

WCA Fabric for NASA Lot# 4 (KAISER)

## 10a. Areal Weight as received, gm/4x4

PTM-3A

LEFT	2.590	2.581	2.586
CENTER	2.552	2.540	2.546
RIGHT	<u>2.596</u>	<u>2.581</u>	<u>2.589</u>
AVG.	2.579	2.567	2.573

## 10b. Volatiles as received, %

PTM-3A

LEFT	.54	.62	.58
CENTER	.51	.51	.51
RIGHT	<u>.58</u>	<u>.62</u>	<u>.60</u>
AVG.	.54	.58	.56

## 10c. Weight change on Acetone wash, %

PTM-3A

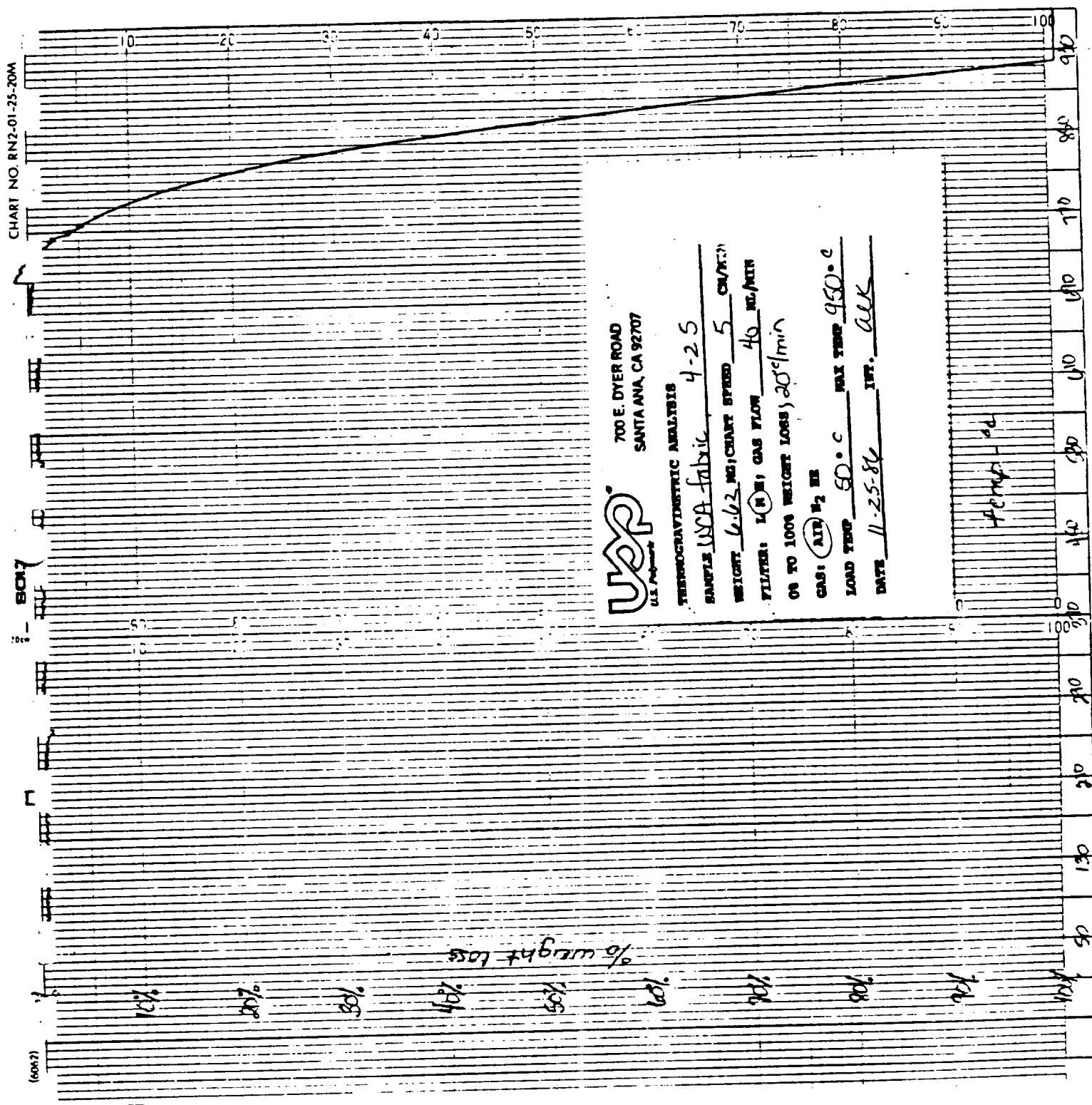
LEFT	.00	-.08	-.04
CENTER	-.16	-.24	-.20
RIGHT	<u>.04</u>	<u>.00</u>	<u>.02</u>
AVG.	-.04	-.11	-.07

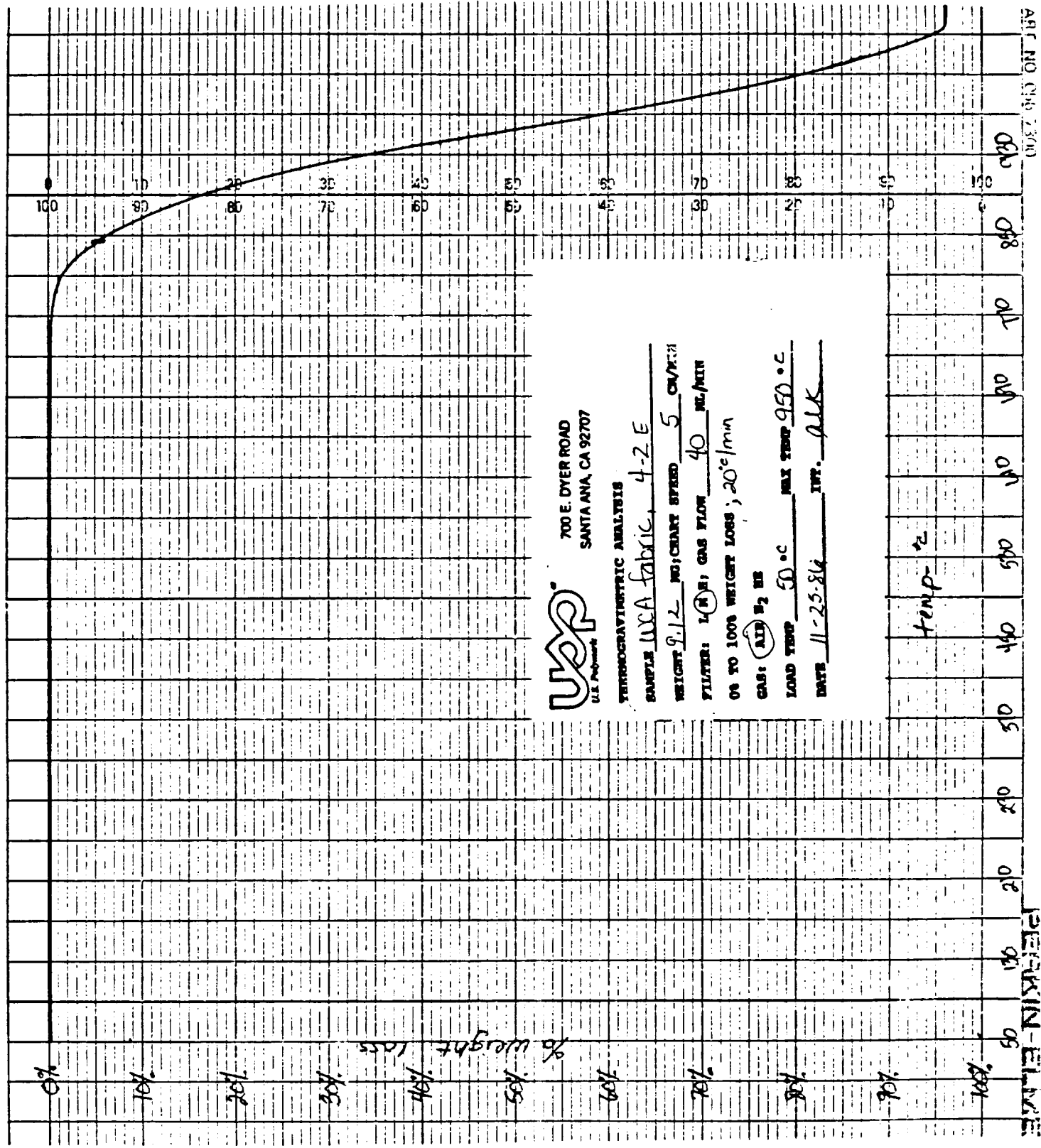
U.S. Polymeric



Hamid M. Quraishi, Manager  
Quality Assurance Department







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NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

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## PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

	<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
1a. Resin Content, Soxhlet, % CTM-6D	32.6 32.3 <u>32.6</u> AVG. 32.5 NASA LOT# 4 AVERAGE	31.6 31.4 <u>31.5</u> 31.5 32.0
1b. Filler Content, Soxhlet, % CTM-6D	14.3 14.2 <u>14.3</u> AVG. 14.3 NASA LOT# 4 AVERAGE	13.9 13.8 <u>13.8</u> 13.8 14.1
1c. Cloth Content, Soxhlet, % CTM-6D	53.1 53.5 <u>53.1</u> AVG. 53.2 NASA LOT# 4 AVERAGE	54.5 54.8 <u>54.7</u> 54.7 54.0
2. Volatile Content, % PTM-17B	3.0 2.7 <u>2.6</u> AVG. 2.8 NASA LOT# 4 AVERAGE	2.7 2.8 <u>2.9</u> 2.8 2.8
3. Flow, 1000 psi, % PTM-19G	17.8 18.1 <u>17.7</u> AVG. 17.9 NASA LOT# 4 AVERAGE	18.1 17.4 <u>17.9</u> 17.8 17.8
4. Resin Content, Dry basis, % PTM-16F, Type II	34.0 33.1 <u>33.5</u> AVG. 33.5 NASA LOT# 4 AVERAGE	32.8 32.2 <u>32.7</u> 32.6 33.1
5. Tack, lbs PTM-80	38 NASA LOT# 4 AVERAGE	42 40
6. Gel Time, seconds PTM-20E	78 NASA LOT# 4 AVERAGE	83 81

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

7a. Atomic Absorption, ppm		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>	<u>LOT#4 AVG.</u>
CTM-53B	Na	25	25	25
	K	2	2	2
	Ca	10	5	8
	Mg	2	2	2
	Li	<u>0</u>	<u>0</u>	<u>0</u>
	TOTAL	39	34	37

7b. Moisture Content, %		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
CTM-53B		2.39	1.94
	NASA LOT# 4 AVERAGE	2.17	

7c. Ash Content, %		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
CTM-53B		.09	.09
	NASA LOT# 4 AVERAGE	.09	

8. TGA, % Weight Loss at 500°C		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
CTM-51 (Nitrogen)		10.7	10.7
	NASA LOT# 4 AVERAGE	10.7	

See chart 8A-8B

9. DSC, °C		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>	<u>LOT#4 AVG.</u>
CTM-50A	First Temp	185	184	185

See Chart 9A-9B

10. Infrared (IRZB) Baseline		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>	<u>LOT#4 AVG.</u>
CTM-21C		.83	.82	.82

See Chart 10A-10B

11. Environmental History		Date manufactured: 30 June 1986
		Packaged in: MIL-B-131
		class I bag
		Date shipped: 31 July 1986 in
		40°F truck

12. Specific Gravity, Cured, Units		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
ASTM D792		1.426	1.432
		1.424	1.433
		<u>1.424</u>	<u>1.435</u>
	AVG.	1.425	1.434
	NASA LOT# 4 AVERAGE	1.429	

13a. Tensile Strength, ksi, WARP		<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
FTMS 406-1011		19.57	19.82
		19.16	19.78
		19.49	20.05
		20.14	20.62
		<u>19.42</u>	<u>19.93</u>
	AVG.	19.56	20.04
	NASA LOT# 4 AVERAGE	19.80	



FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

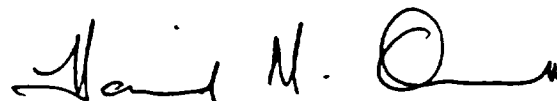
	<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
13b. Tensile Modulus, ksi, WARP	1.93	2.00
FTMS 406-1011	2.26	2.13
	2.12	2.20
	2.21	2.31
	<u>2.14</u>	<u>2.10</u>
AVG.	2.13	2.15
NASA LOT# 4 AVERAGE	2.14	
13c. Tensile Elongation, %, WARP	1.28	1.26
FTMS 406-1011	1.20	1.29
	1.15	1.22
	1.15	1.34
	<u>1.13</u>	<u>1.25</u>
AVG.	1.18	1.27
NASA LOT# 4 AVERAGE	1.23	
14a. Flexural Strength, ksi, WARP	26.60	27.76
FTMS 406-1031	27.19	27.81
	26.82	28.13
	28.14	28.39
	<u>27.97</u>	<u>27.47</u>
AVG.	27.34	27.91
NASA LOT# 4 AVERAGE	27.63	
14b. Flexural Modulus, ksi, WARP	1.85	1.92
FTMS 406-1031	1.89	1.90
	1.91	1.90
	1.92	1.93
	<u>1.98</u>	<u>1.96</u>
AVG.	1.91	1.92
NASA LOT# 4 AVERAGE	1.92	
15a. Compressive Strength, ksi, WARP	19.11	19.66
FTMS 406-1021	20.94	19.37
	18.86	17.91
	18.75	18.69
	<u>21.39</u>	<u>19.95</u>
AVG.	19.81	19.12
NASA LOT# 4 AVERAGE	19.46	
15b. Compressive Modulus, ksi, WARP	1.98	2.01
FTMS 406-1021	2.01	2.07
	2.07	2.05
	2.03	2.10
	<u>2.02</u>	<u>2.08</u>
AVG.	2.02	2.06
NASA LOT# 4 AVERAGE	2.04	

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

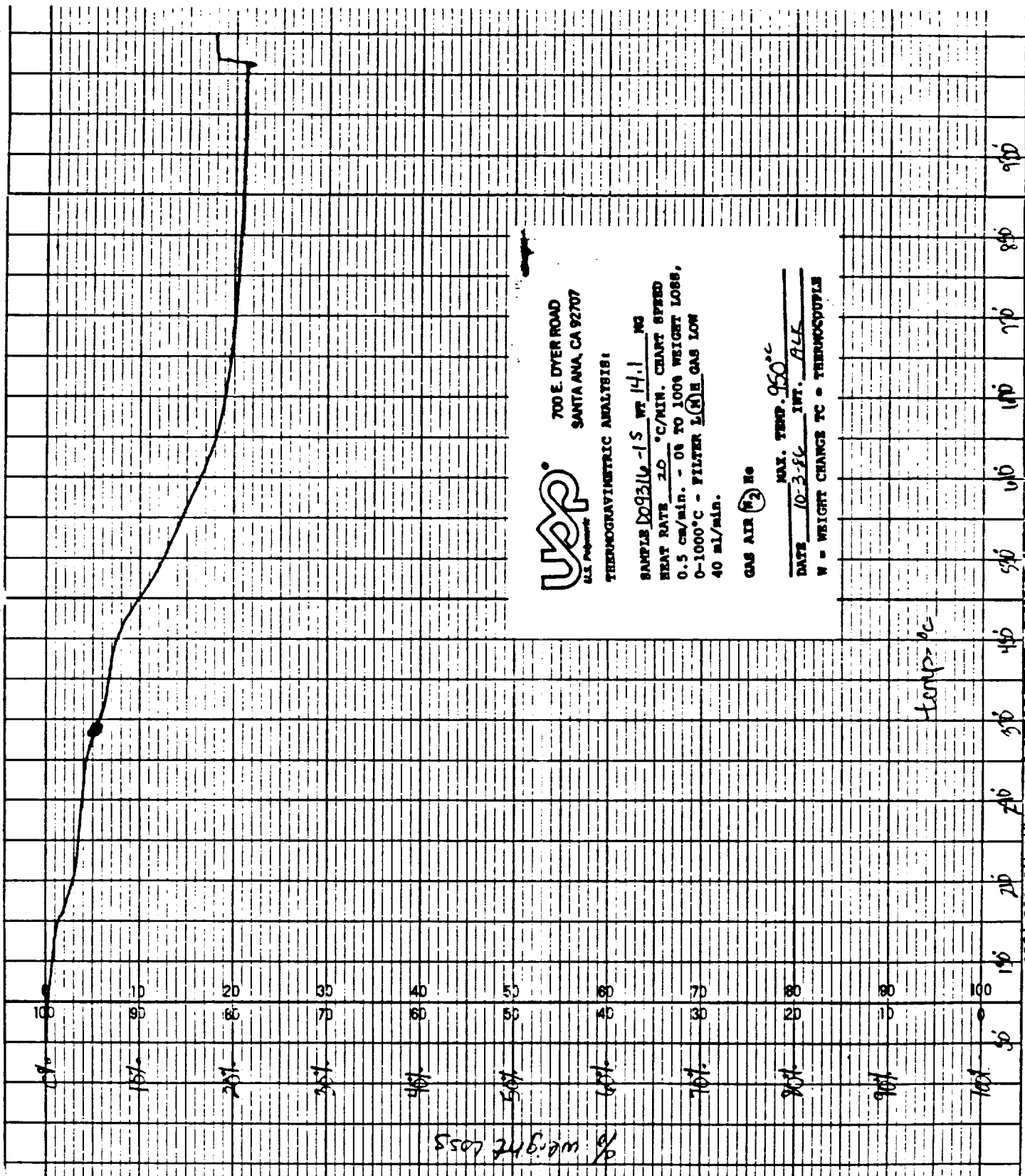
	<u>ROLL#1-S</u>	<u>ROLL#1-E</u>
16. Double Shear Strength, ksi FTMS 406-1041A	2.41	2.37
	2.48	2.40
	2.35	2.34
	2.47	2.34
	<u>2.29</u>	<u>2.23</u>
AVG.	2.40	2.34
NASA LOT# 4 AVERAGE	2.37	
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	59.2	58.0
	NASA LOT# 4 AVERAGE	58.6
18. Residual Volatiles, % PTM-98	1.20	1.29
	1.20	1.09
	<u>1.23</u>	<u>1.10</u>
AVG.	1.21	1.16
NASA LOT# 4 AVERAGE	1.18	
19. Resin Content, Pyrolysis, % CTM-14B	29.34	30.64
	30.17	31.67
	<u>28.62</u>	<u>30.07</u>
AVG.	29.38	30.79
NASA LOT# 4 AVERAGE	30.09	
20. Acetone Extraction, % CTM-18A	5.38	6.14
	6.28	5.87
	<u>5.12</u>	<u>6.48</u>
AVG.	5.60	6.16
NASA LOT# 4 AVERAGE	5.88	
21a. CTE, in/in °F with PLY PTM-61B	1.81	3.58
	<u>2.64</u>	<u>1.09</u>
AVG.	2.23	2.34
NASA LOT# 4 AVERAGE	2.28	
21b. CTE, in/in °F Cross PLY PTM-61B	4.06	3.66
	<u>2.57</u>	<u>5.33</u>
AVG.	3.32	4.50
NASA LOT# 4 AVERAGE	3.91	

See Chart 21A-21B

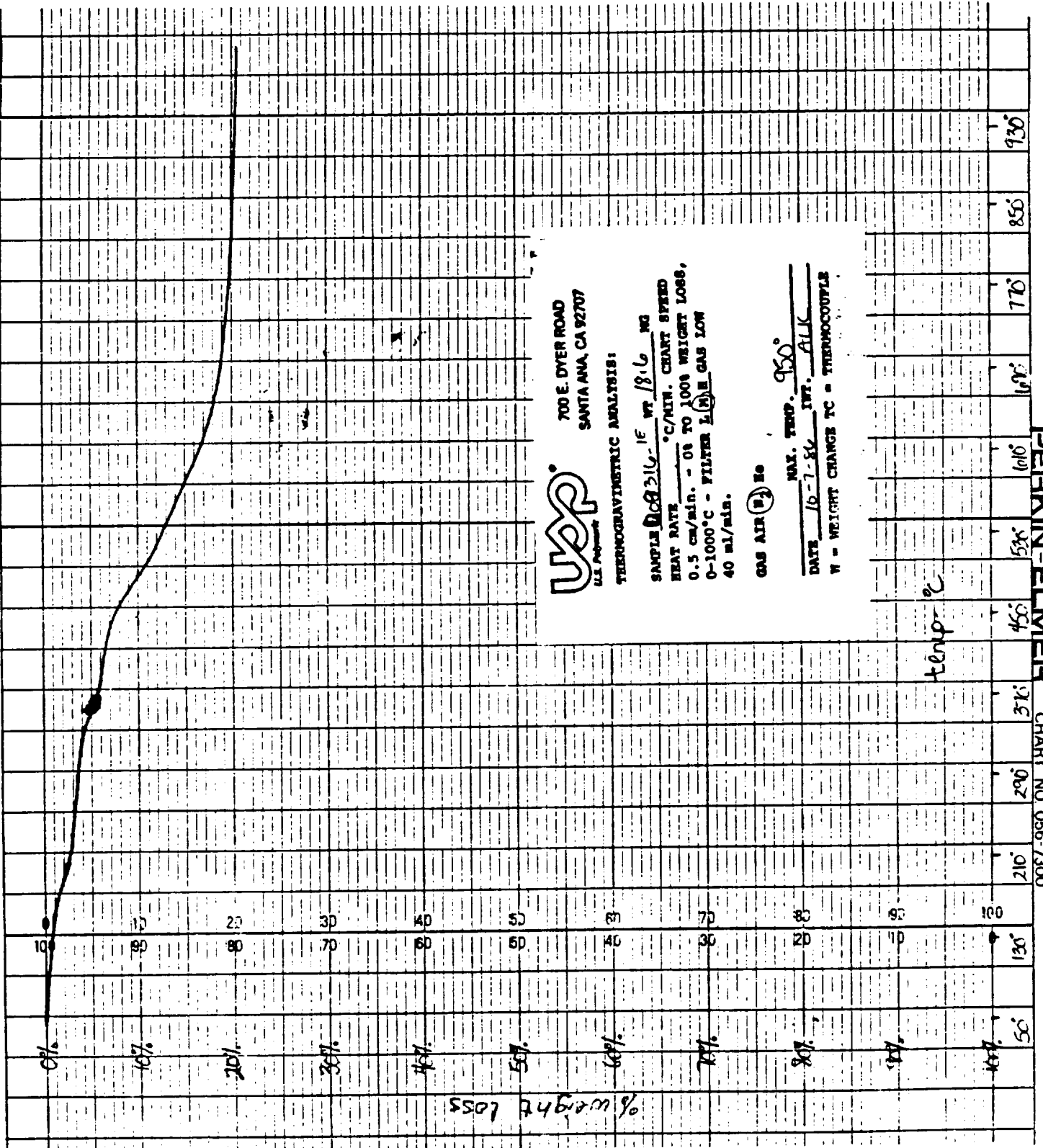
U.S. Polymeric



Hamid M. Quraishi, Manager  
Quality Assurance Department



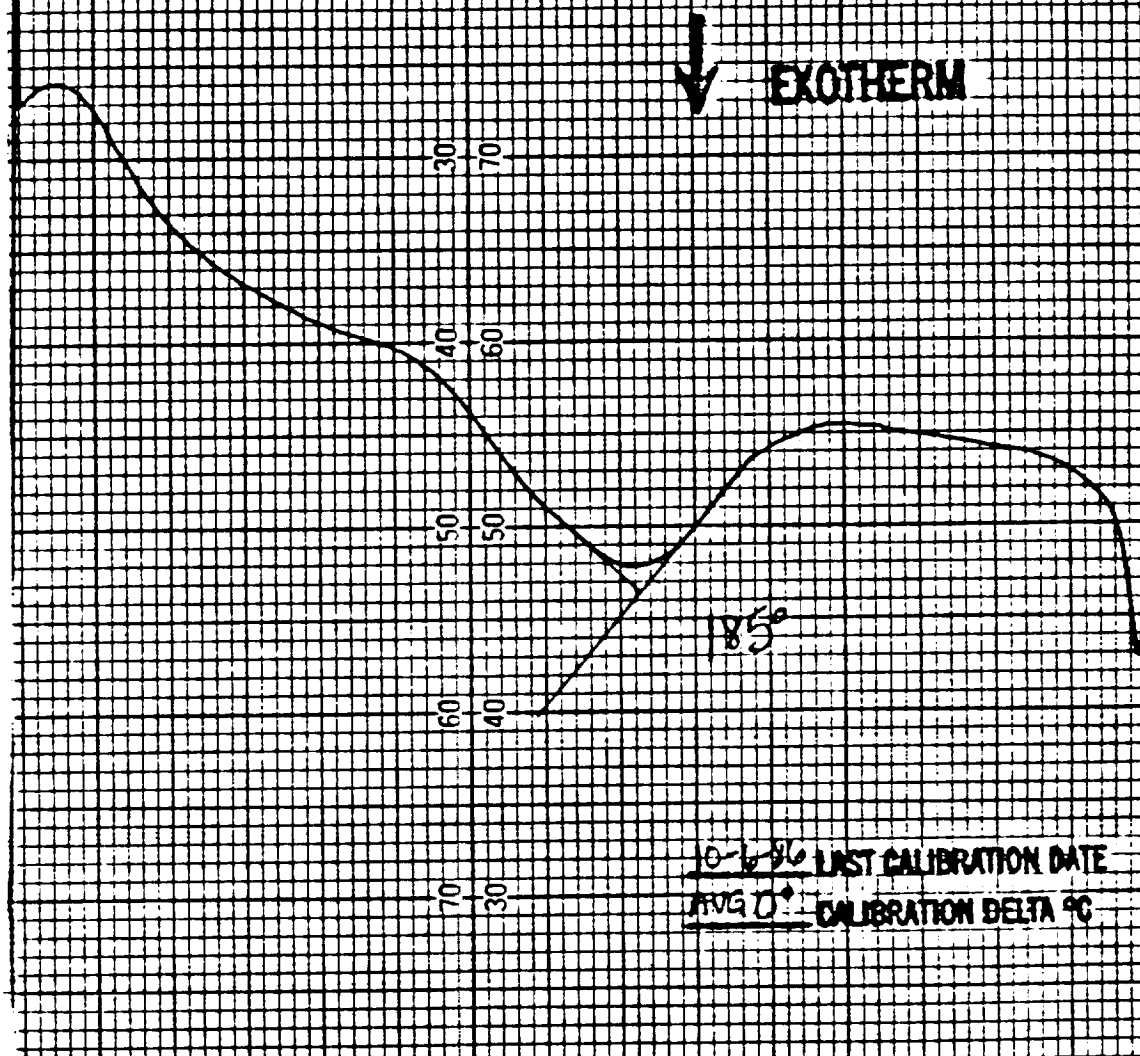
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PERKIN-ELMER

CHART NO 056-7300

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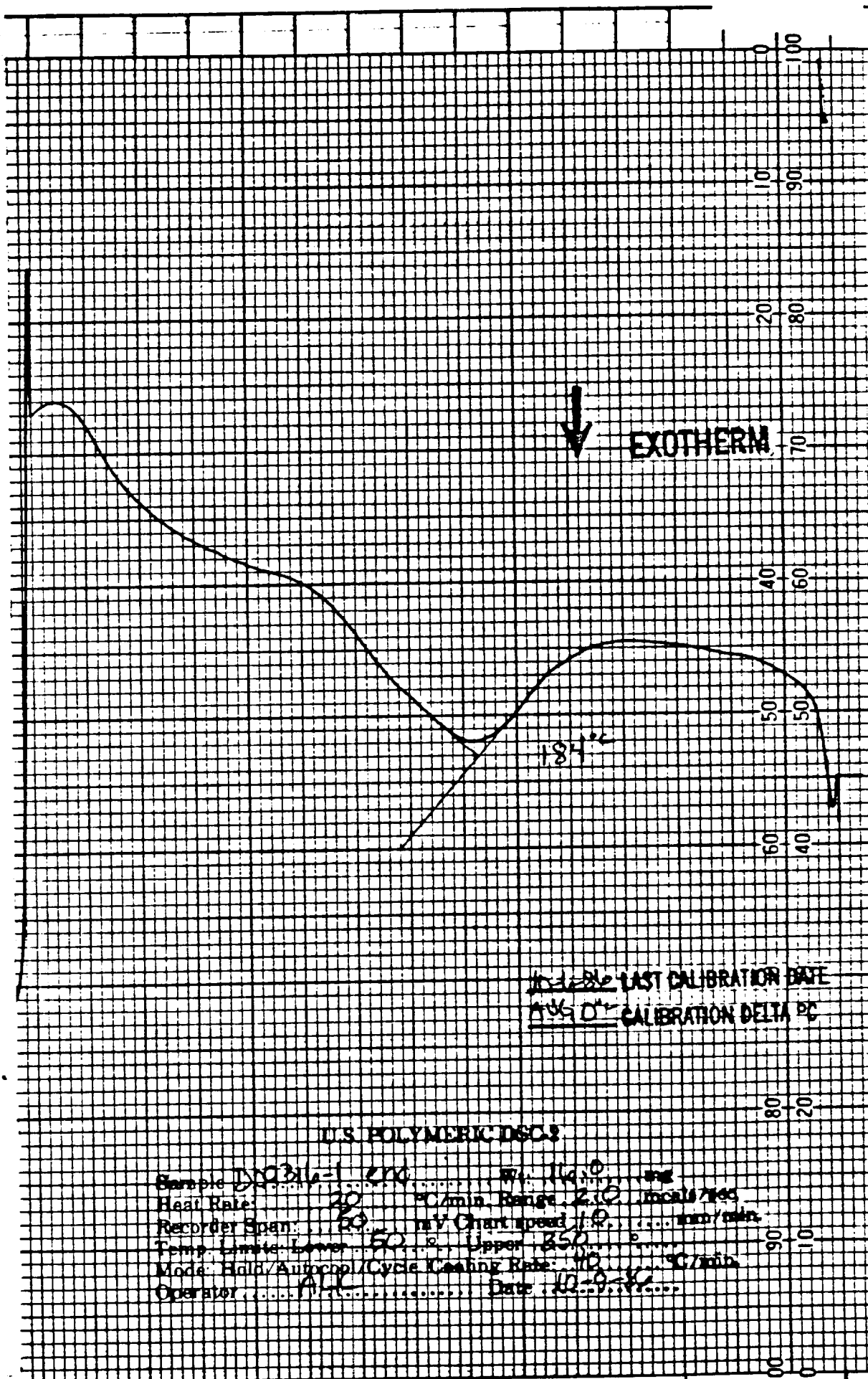


10-6-86 LAST CALIBRATION DATE  
AVG 0° CALIBRATION DELTA °C

U.S. POLYMERIC DSC-2

Sample: 109310-1504 Wt: 15.6 mg  
Heat Rate: 20 °C/min. Range: 2.2 mV/sec  
Recorder Span: 50 mV Chart speed: 10 mm/min  
Temp. Limits: Lower 50 °C Upper 350 °C  
Mode: Hold/Autopool/Cycle Cooling Rate: 1/6 °C/min  
Operator: ALK Date: 10-6-86

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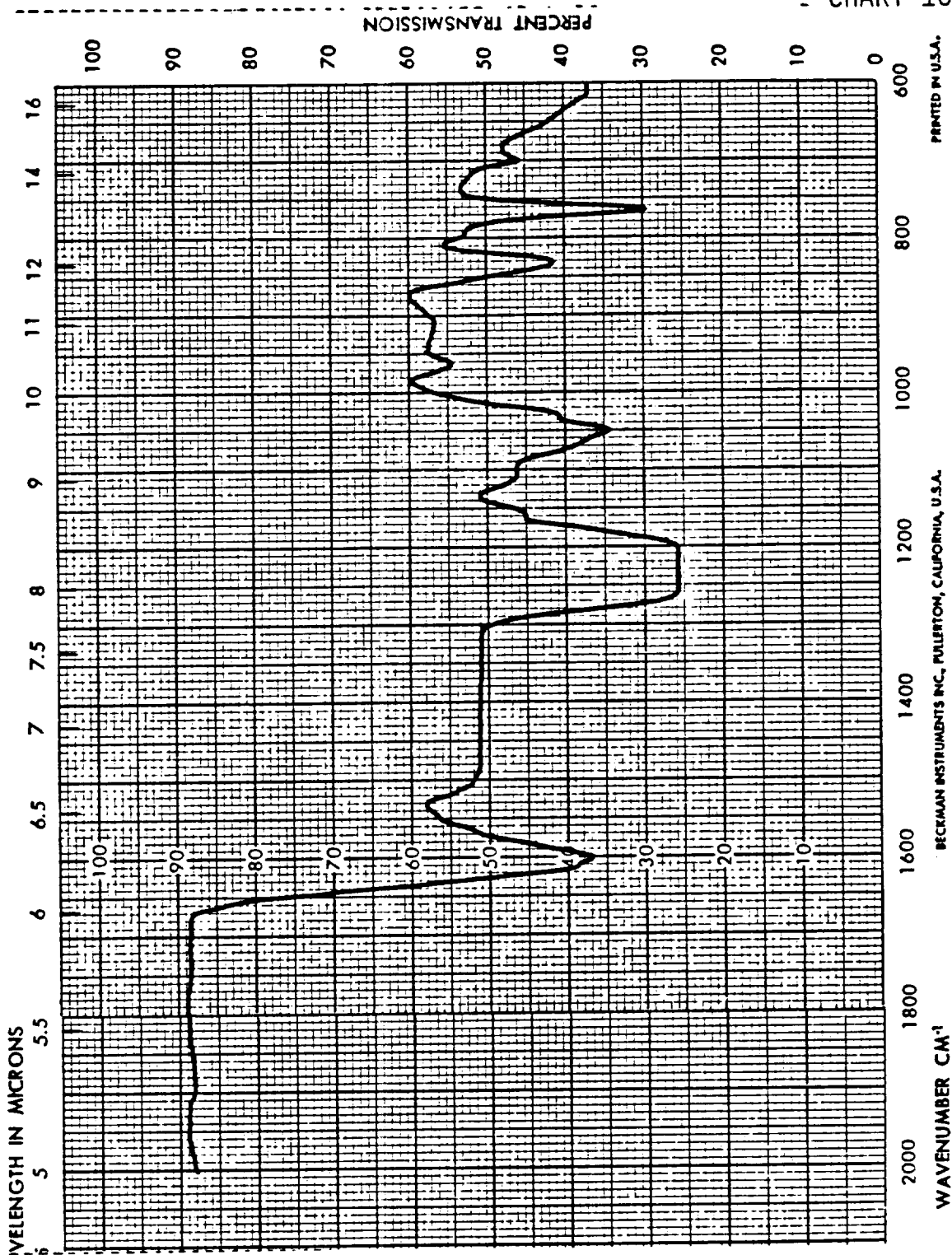


LAST CALIBRATION DATE  
CALIBRATION DELTA PC

U.S. POLYMERIC DSC-3

Sample: 100314-1 2nd wt. 116.0 mg  
Heat Rate: 20 °C/min Range: 2.0 mcal/sec  
Recorder Span: 50 mV Chart speed: 1.0 mm/min  
Temp. Limits: Lower 50 Upper 350  
Mode: Hold/AutoCool/Cycle Cooling Rate: 10 °C/min  
Operator: ALK Date: 12-9-82

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SPECTRUM NO. 15197

DATE 7-07-86

SAMPLE FM 50641

D093116 #51-

SOURCE \_\_\_\_\_

STRUCTURE \_\_\_\_\_

PATH 0.2 mm NaCl

SOLVENT ACETONE

CONCENTRATION 30-50%

PHASE 3

COMMENTS PRE-PREG

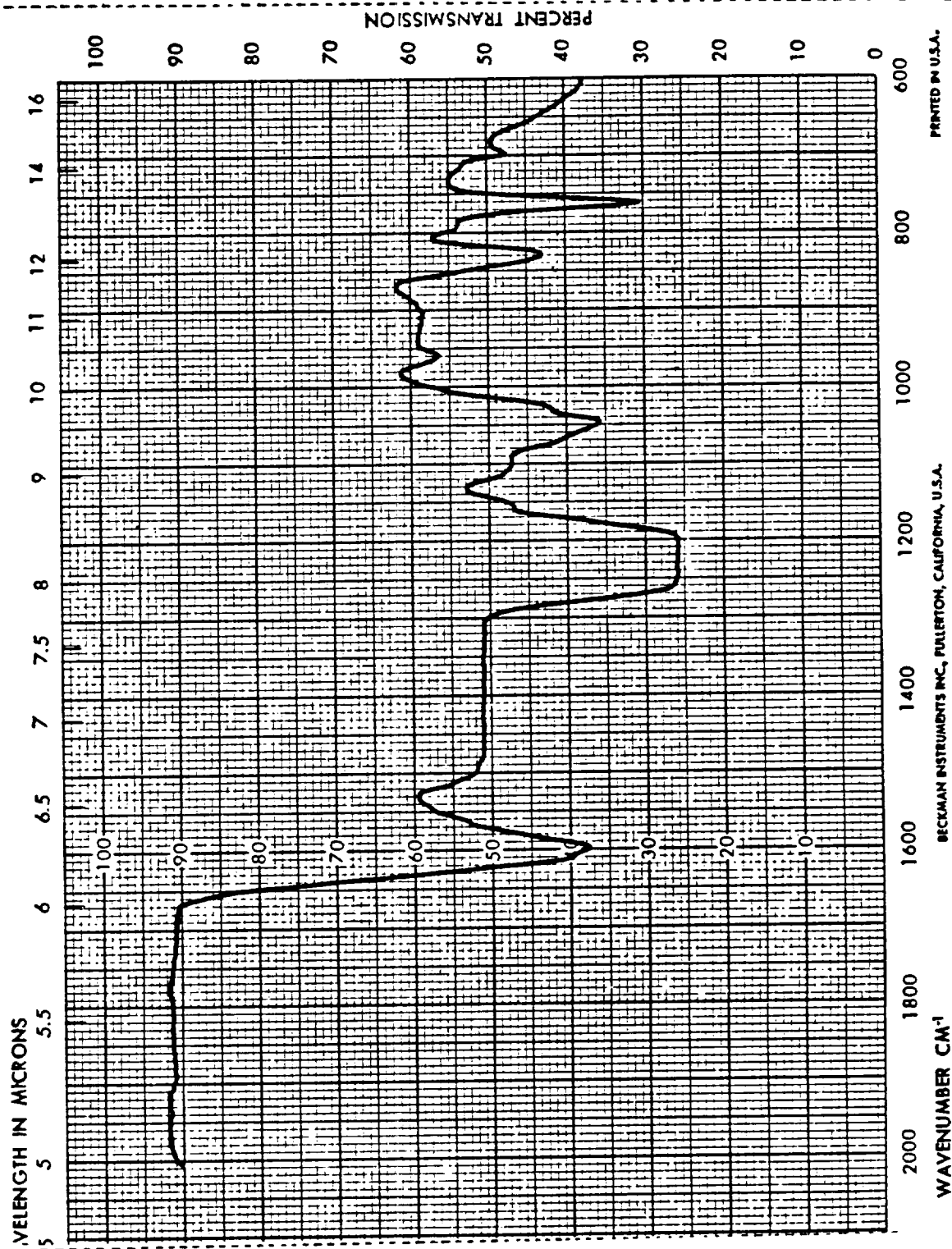
MATERIAL

ANALYST Y. MIRANDA

**Beckman®**

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SPECTROPHOTOMETER

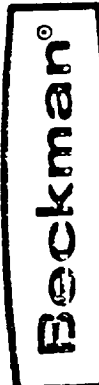
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SPECTRUM NO. 15198  
 DATE 7-07-86  
 SAMPLE FM 50641  
DO9316 # E-1  
 SOURCE \_\_\_\_\_  
 STRUCTURE \_\_\_\_\_

PATH 0.2 mm NaCl  
 SOLVENT ACETONE  
 CONCENTRATION 30-50%  
 PHASE 3  
 COMMENTS PBS-PQEG  
 MATERIAL \_\_\_\_\_

ANALYST Y. MIRANDA



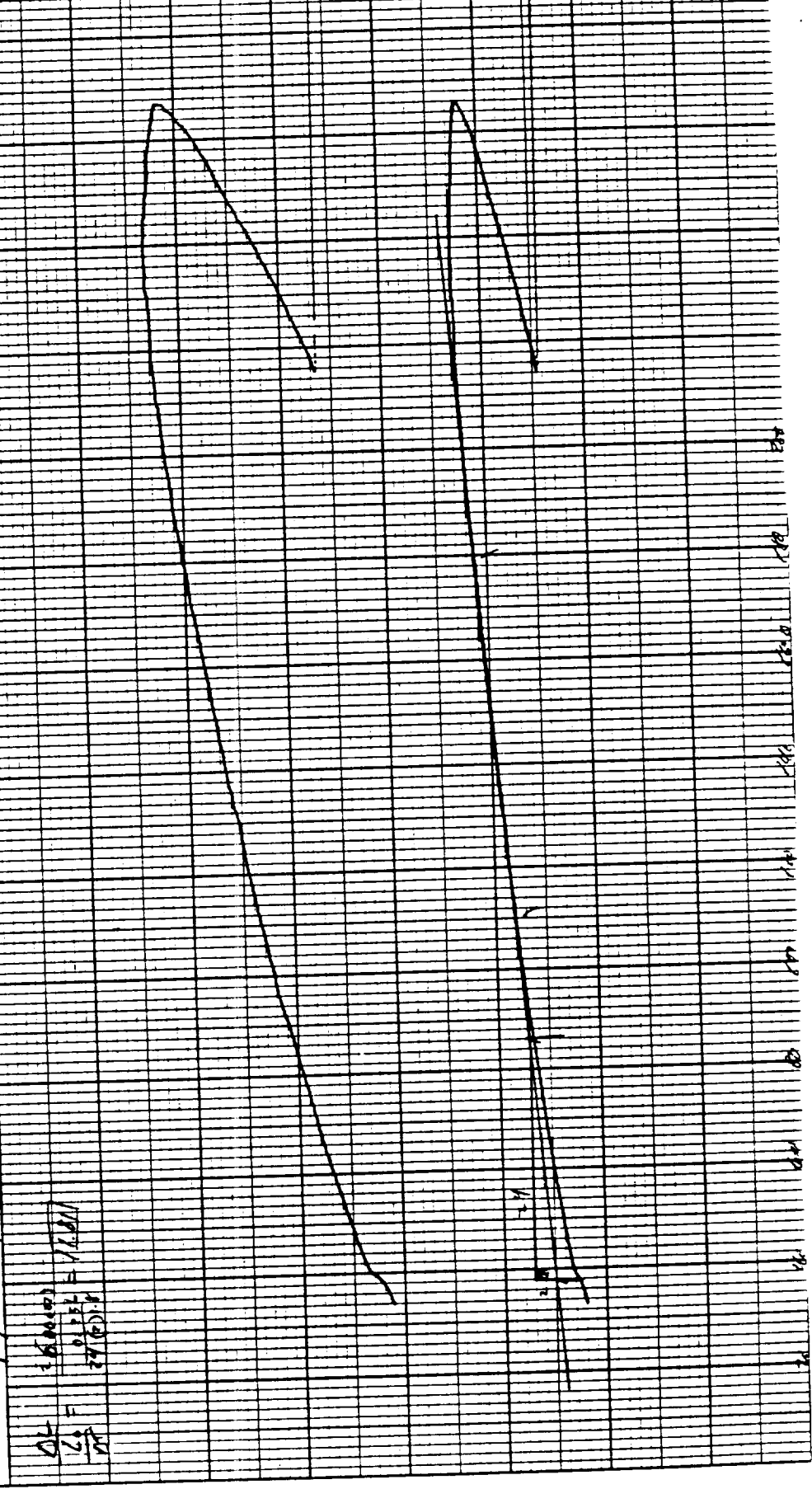
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PART NO. 990088

RUN NO. _____ OPERATOR <u>DL</u> SAMPLE <u>D-9316-1-3200T-(1)</u> ATM. <u>DM</u> @ <u>57</u> FLOW RATE <u>3.55 (10)</u>	<b>T-AXIS</b> SCALE: °C/in. <u>20</u> PROG. RATE: °C/min. <u>1</u> HEAT / COOL <u>ISO</u> SHIFT: in. <u>0</u>	<b>DTA-OSC</b> SCALE: °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	<b>TGA</b> SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	<b>TMA</b> (in/in) SCALE, mile/in. <u>0.10</u> MODE <u>Exhausted</u> SAMPLE SIZE <u>0.256</u> LOAD, g <u>1</u> dY, (10X), (mile/min)/in. _____
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PART NO. 990088

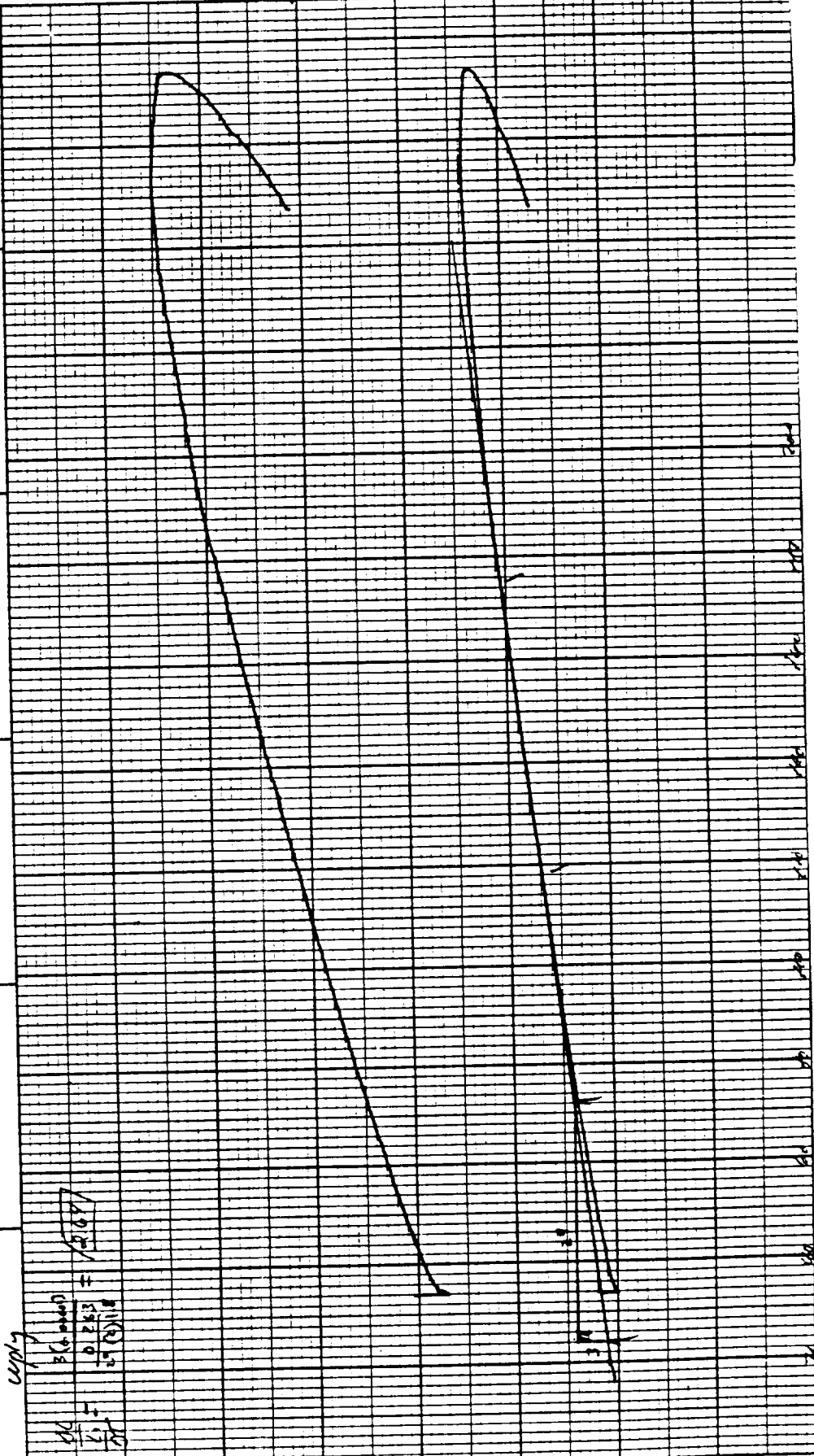
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DU PONT Instruments

MEASURED VARIABLE

$$\frac{dY}{dT} = \frac{2(6.0000)}{0.253} = 2.697$$

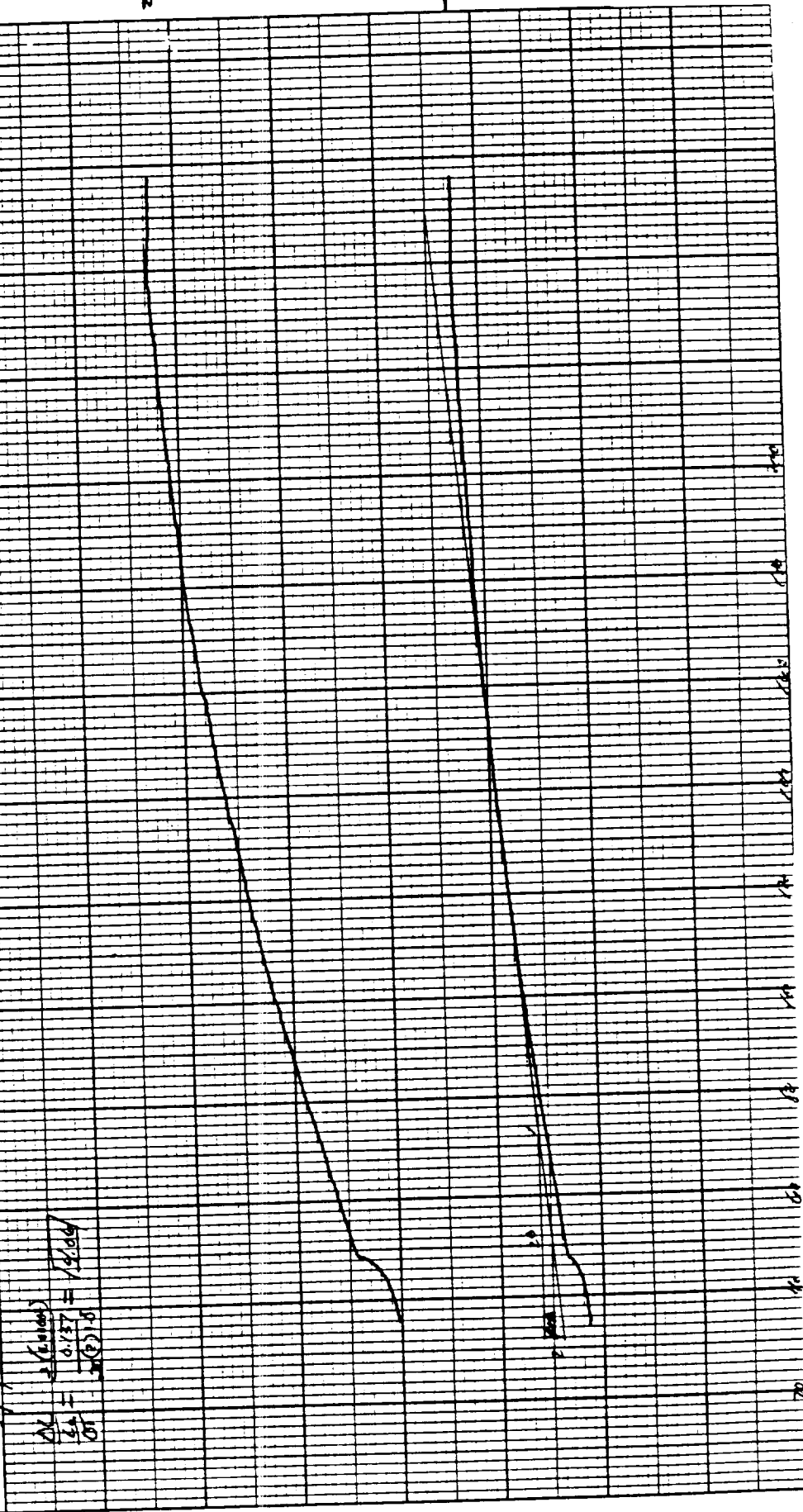
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PART NO. 490088

RUN NO. <u>DATE 11/1/86</u> OPERATOR <u>D</u> SAMPLE <u>D09316-1-SMPL. (2)</u> ATM <u>Ar</u> @ <u>STP</u> FLOW RATE <u>553 CFH</u>	<b>T-AXIS</b> SCALE, °C/in <u>20</u> PROG. RATE, °C/min <u>0</u> HEAT <input checked="" type="checkbox"/> COOL <input type="checkbox"/> ISO <input type="checkbox"/> SHIFT, in <u>0</u>	<b>DTA-DSC</b> SCALE, °C/in <u>20</u> (mcal/sec)/in WEIGHT, mg REFERENCE	<b>TGA</b> SCALE, mg/in SUPPRESSION, mg WEIGHT, mg TIME CONST, sec dY, (mg/min)/in	<b>TMA</b> <u>(in/in)</u> SCALE, mils/in <u>0.1/0.2</u> MODE <u>EXTRUSION</u> SAMPLE SIZE <u>0.137</u> LOAD, g <u>0</u> dY, (10X), (mils/min)/in
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RUN NO. DATE 12/10  
 OPERATOR IN  
 SAMPLE D0936-1-2001-(H)  
 ATM AN @ 500  
 FLOW RATE 3.500L

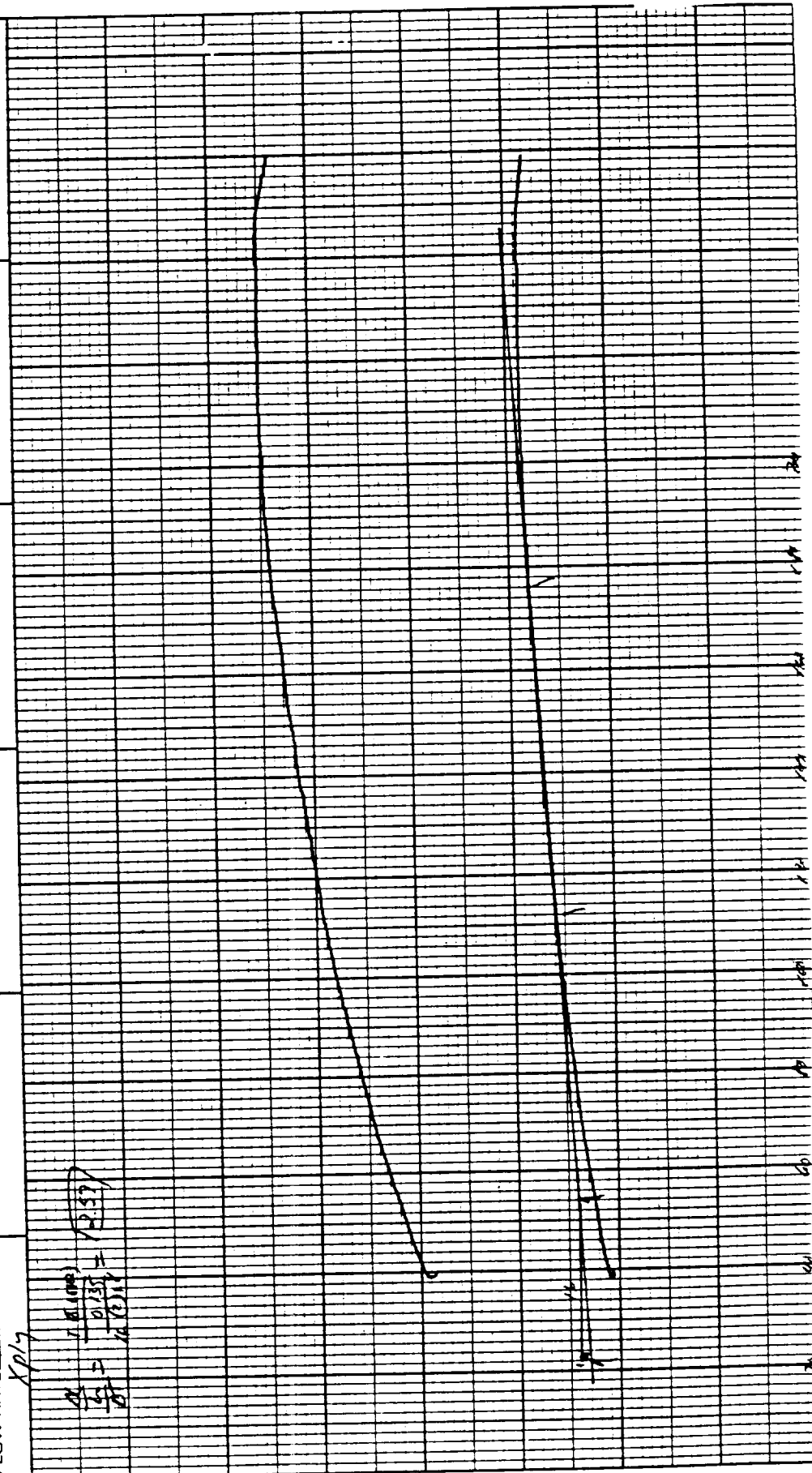
SCALE, °C/in 50 20  
 PROG. RATE, °C/min 1  
 HEAT ✓ COOL ISO  
 SHIFT, in 0

SCALE, °C/in. \_\_\_\_\_  
(mcal/sec)/in. \_\_\_\_\_  
WEIGHT, mg \_\_\_\_\_  
REFERENCE \_\_\_\_\_

SCALE, mg/in \_\_\_\_\_  
SUPPRESSION, mg \_\_\_\_\_  
WEIGHT, mg \_\_\_\_\_  
TIME CONST., sec \_\_\_\_\_  
dy. (mg/min) /in \_\_\_\_\_

SCALE, mils/in 0.1/0.2  
MODE 6.4 kHz  
SAMPLE SIZE 0.135  
LOAD, g 10  
dy. (10X) (mils/min)/in         

$\frac{12.57}{100} = \frac{12.57}{100}$   
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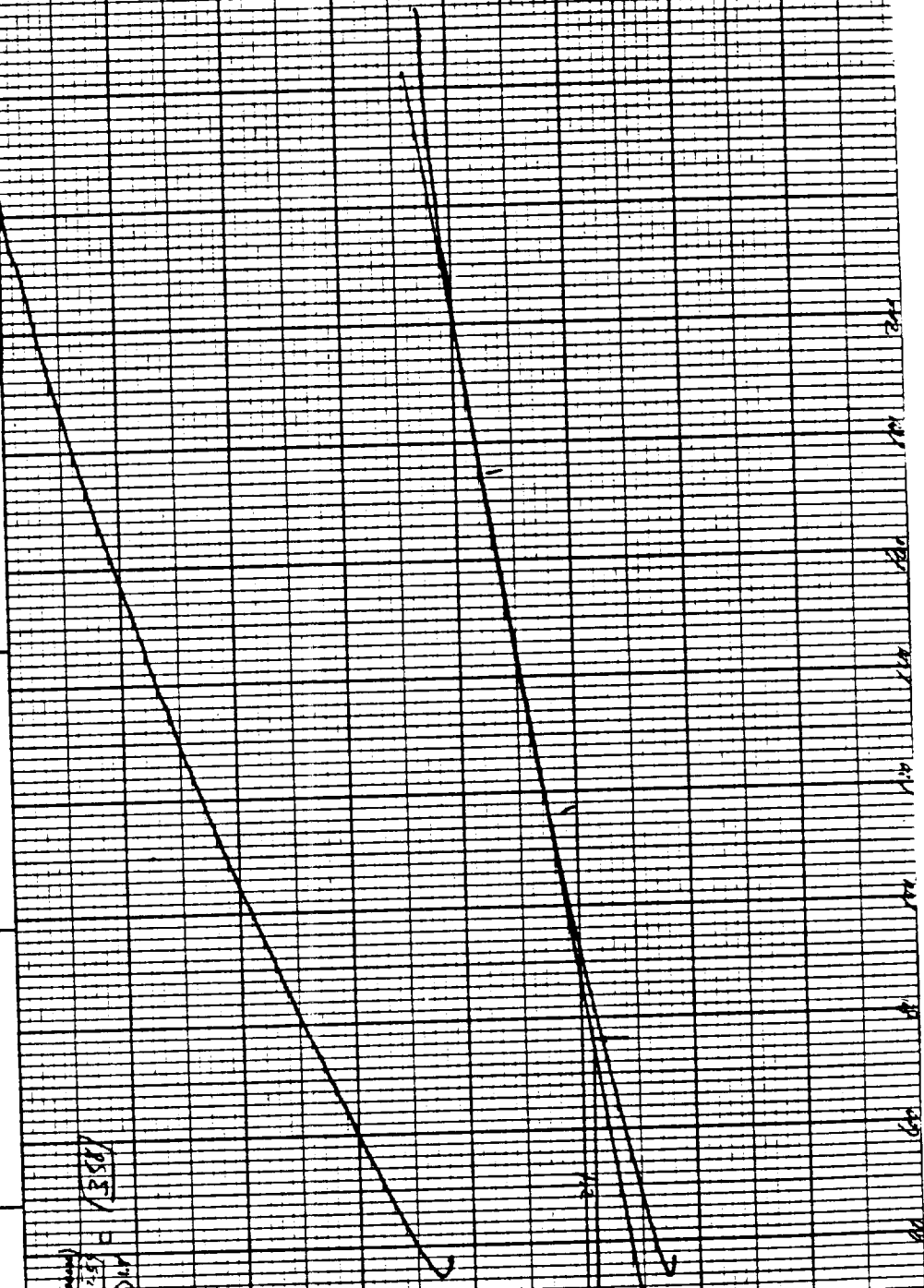
Chart 21B1

PART NO. 990088

RUN NO. _____ OPERATOR <u>JA</u> SAMPLE <u>D09316-1-6.00 - (1)</u> ATM. <u>20</u> <u>50</u> FLOW RATE <u>2.5 L/min</u>	<b>T-AXIS</b> SCALE: °C/in. <u>50</u> <u>20</u> PROG. RATE: °C/min <u>10</u> HEAT COOL <u>150</u> SHIFT, in. <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in. _____ (mcal/sec)/in. _____ WEIGHT, mg _____ REFERENCE _____	<b>TGA</b> SCALE, mg/in. _____ SUPPRESSION, mg _____ WEIGHT, mg _____ TIME CONST., sec _____ dY, (mg/min)/in. _____	<b>TMA</b> <u>film (unit)</u> SCALE, mile/in. <u>0.1/0.2</u> MODE <u>Static</u> SAMPLE SIZE <u>0.33</u> LOAD, g <u>10</u> dY, (10X), (mile/min)/in. _____
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DU PONT Instruments MEASURED VARIABLE

$\frac{dW}{dt} = \frac{8(1.2 \text{ mg})}{1.2 \text{ min}} = 1.33$   
 $\frac{dW}{dt} = 1.33 \text{ (mg/min)}$



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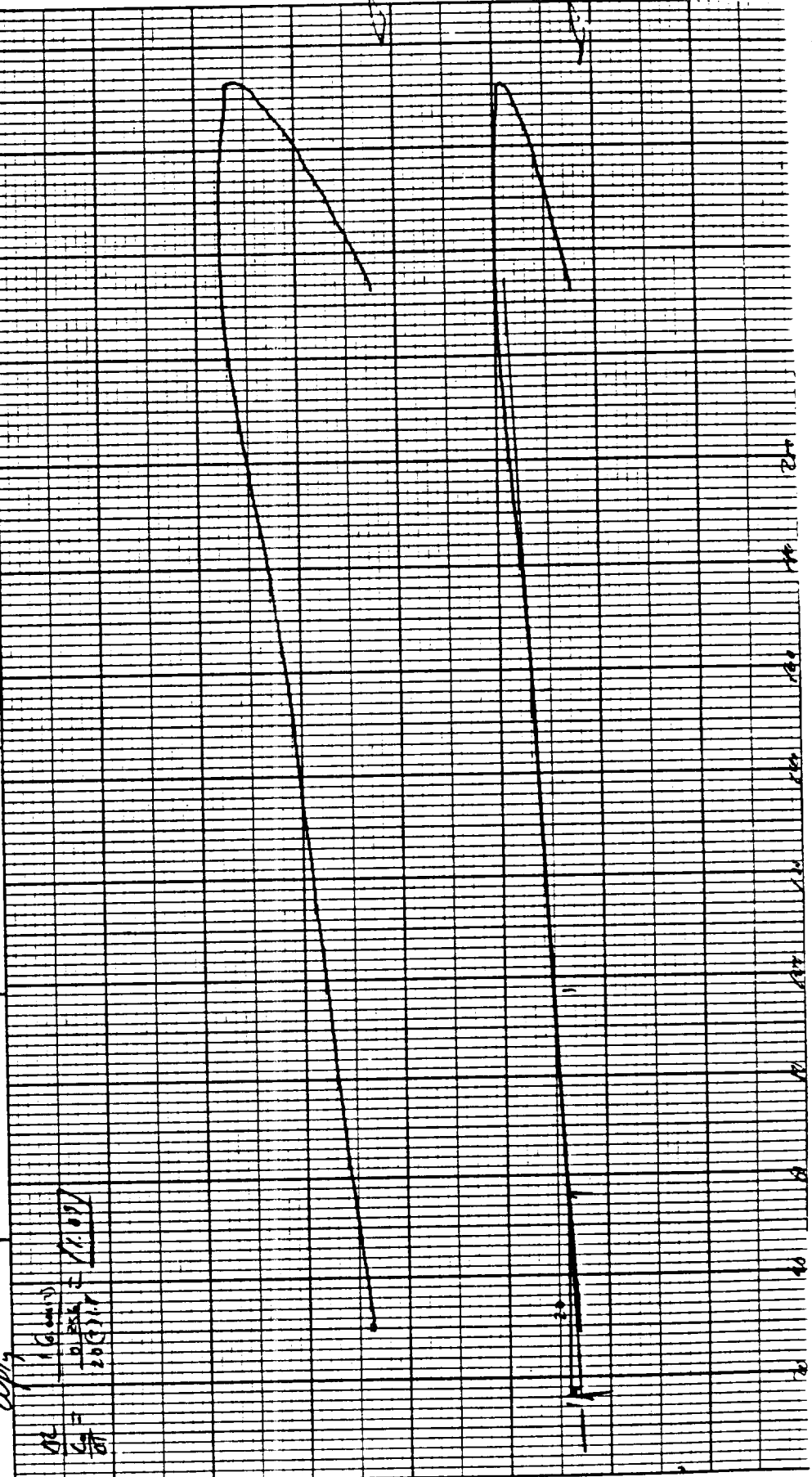
Chart 21B2

PART NO. 990088

RUN NO. <u>1411</u> OPERATOR <u>DL</u> SAMPLE <u>D61316-1-60 (6)</u> ATM. <u>DL</u> @ <u>SD</u> FLOW RATE <u>3.5 SL/H</u>	<b>T-AXIS</b> SCALE: °C/in <u>50</u> 2° PROG. RATE: °C/min <u>1</u> HEAT / COOL <u>ISO</u> SHIFT: in <u>0</u>	<b>DTA-DSC</b> SCALE: °C/in <u>          </u> (mcal/sec)/in <u>          </u> WEIGHT, mg <u>          </u> REFERENCE <u>          </u>	<b>TGA</b> SCALE, mg/in <u>          </u> SUPPRESSION, mg <u>          </u> WEIGHT, mg <u>          </u> TIME CONST., sec <u>          </u> dY, (mg/min)/in <u>          </u>	<b>TMA</b> (µin/in) SCALE, mils/in <u>0.1</u> 2 MODE <u>EXAMIN</u> SAMPLE SIZE <u>0.25</u> LOAD, g <u>1</u> dY, (10X) (mils/min)/in <u>          </u>
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DU PONT Instruments MEASURED VARIABLE

$\frac{dW}{dt} = \frac{16.0 \text{ (mg/min)}}{20.0 \text{ (min)}} = 0.8$   
 $\frac{dW}{dt} = 11.07$



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PART NO. 990086

RUN NO. _____ OPERATOR <u>DA</u> SAMPLE <u>105316-1-600-(3)</u> ATM. AIR <u>0.507</u> FLOW RATE <u>3-55(L)</u>	<b>T-AXIS</b> SCALE: °C/in <u>50</u> <u>20</u> PROG. RATE: °C/min <u>10</u> HEAT <u>COOL</u> <u>ISO</u> SHIFT: in _____	<b>DTA-DSC</b> SCALE: °C/in _____ (mcal/sec)/in _____ WEIGHT: mg _____ REFERENCE _____	<b>TGA</b> SCALE: mg/in _____ SUPPRESSION: mg _____ WEIGHT: mg _____ TIME CONST.: sec _____ dY: (mg/min)/in _____	<b>TMA</b> $(\mu\text{in}/\text{in}^2)$ SCALE: mile/in <u>0.1/1.2</u> MODE <u>EXPAN</u> SAMPLE SIZE <u>0.13Y</u> LOAD: g <u>2</u> dY: (10X) (mile/min)/in _____
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DU PONT Instruments

DU PONT

MEASURED VARIABLE

$\frac{105316-1-600-(3)}{3-55(L)} = 15.66$   
 $\frac{105316-1-600-(3)}{3-55(L)} = 15.66$   
 $\frac{105316-1-600-(3)}{3-55(L)} = 15.66$

Xp/ly

1/10 (1000)

0.13Y = 15.66

1/10 (1000)

Xp/ly

1/10 (1000)

0.13Y = 15.66

1/10 (1000)

PART NO. 990088

